THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIV. No. 606.] LONDON, DECEMBER 22, 1874. [26TH YEAR.] Price 6d.

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The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
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GAS-RETORTS introduced 1828. FIRE-BRICK WORKS, established 1864. FIRE-CLAY SANITARY PIPES, CHIMNEY TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
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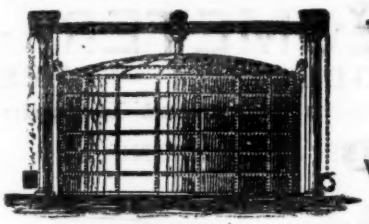

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GIROUD'S PATENT RHEOMETER.

Sole Licensees and Agents for the United Kingdom of Great Britain,

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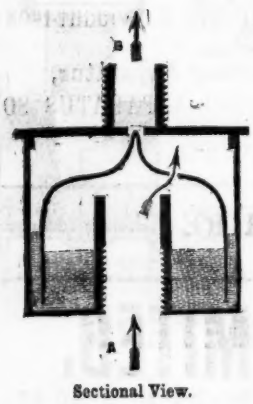
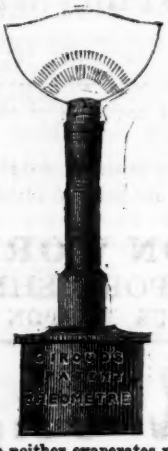


Sectional View.



Glycerine neither evaporates nor freezes at ordinary degrees of temperature.

Inside a Lamp.

Under a Globe Burner.

The RHEOMETER is a new apparatus of measurement; it is entirely made of "metal," and works "inside a closed vessel." It determines the quantity of gas to be consumed; and this quantity remains unchangeable, whichever be the burner employed, and whatever be the pressure.

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For Domestic Purposes.—Saving of Gas.—Possibility of adopting low-pressure burners, which give as much as "four times more light" than the others, with the same volume.

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For Town Lighting.—The Rheometer is a guarantee that the contract for lighting is duly carried out. Thus, good burners may be adopted, and the lighting thereby improved, without the gas company having any interest in intervening to oppose such a measure.

All Orders should mention what quantity per hour the Rheometer is intended to regulate.

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EITHER WITH

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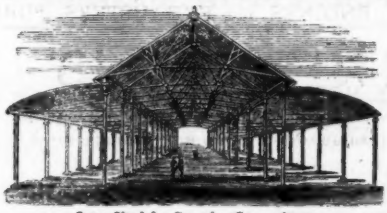
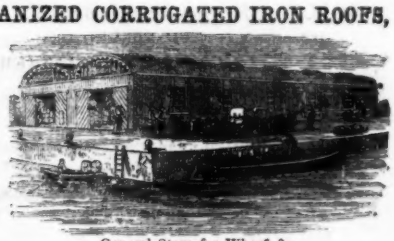


Open Shed for Covering Large Areas.



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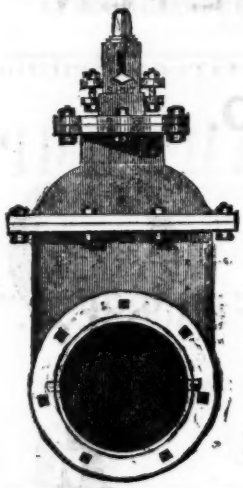


These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

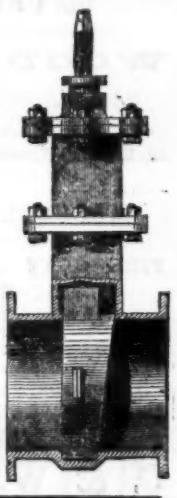
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



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FOR

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SAVES COAL, RETORTS, FUEL, LABOUR, TIME, SPACE, AND CAPITAL.

PREVENTS STOPPAGE OF ASCENSION-PIPES, DEPOSITION OF CARBON IN RETORTS, THICKENING OF TAR IN HYDRAULIC MAIN.

GIVES MORE GAS PER TON OF COAL. WITH HIGHER ILLUMINATING POWER, SATISFACTION, AND PROFIT TO SHAREHOLDERS AND MANAGERS.

IS STRONG, SIMPLE, EASILY FIXED AND WORKED, AND THOROUGHLY EFFICIENT AT ALL TIMES.

TESTIMONIAL.

Gas-Works, Guildford, Sept. 15, 1874.

GENTLEMEN,—The five retorts fitted with your Patent Moveable Seal for Dip-Pipes, on June 30, have been in constant use since that date, and have worked in a most satisfactory manner.

These Retorts are still quite clean and free from carbon, whilst others not so fitted, after being at work eight weeks, required scurfing, having a deposit of carbon 2 inches in thickness on the inside.

I also find a slight increase in the yield of gas per ton of coal carbonized, although your Patent Seals are fitted to but one-fifth of the Retorts now at work.

As your statements respecting your apparatus are fully confirmed by the results obtained in practical working, I should wish you at once to fix one to each of the ovens at these works, that I may obtain all possible advantage during the coming winter.

Yours truly,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street, E.C. JOS. SHAW, Manager.

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N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, Agent.

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For REPAIRING RETORTS while in ACTION, &c.
SOLE MANUFACTURER,
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INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
NEWCASTLE-ON-TYNE.

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GAS-RETORTS, GLASS-HOUSE FURNACE,
BLAST-FURNACE, & TANK BRICKS, LUMPS, TILES,
And Every Description of Best Fire-Bricks.

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MANUFACTURERS OF
TELESCOPIC AND SINGLE-LIFT
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CONDENSERS, SCRUBBERS, & PURIFIERS.
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FITTERS & MAIN-LAYERS.
RETORTS SET ON THE LATEST IMPROVED PLAN.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
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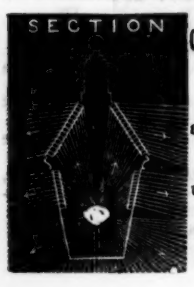

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CATOPTRIC LAMP
Is now in use in
Moorgate Street,
Cheapside,
and Trafalgar Square,
and has been in
successful operation
upon Waterloo Bridge
since Oct. 7, 1871.
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GAS ENGINEERS,
Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,
EDINBURGH, AND
2, KING EDWARD STREET,
NEWGATE STREET, LONDON.
Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.
STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,
And every description of Gas-Fittings and Gas Apparatus.

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IMPROVED GAS-VALVES
WITH WROUGHT-IRON PINIONS,
List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.
These Valves are all proved on both sides to 30 lbs. on the square inch before leaving the works, and are always kept in stock.
VALVES MADE WITH OUTSIDE RACKS TO ORDER.
ALSO, SCREW WATER-VALVES WITH GUN-METAL FACES.
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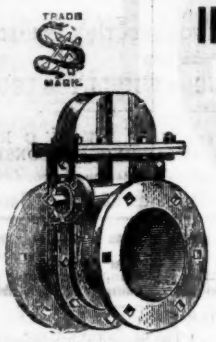

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MAKERS OF STEAM-ENGINES,
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WAS AWARDED, AT THE
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THE GRAND PRIZE "MEDAL OF PROGRESS."

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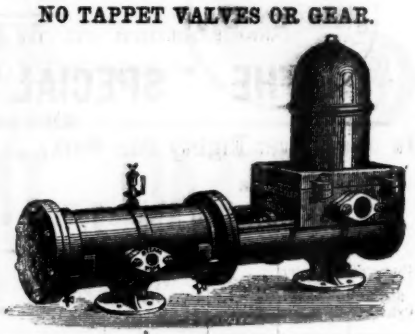

IN USE IN SOME OF
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FOR
TAR AND AMMONIACAL LIQUORS.

One selected from amongst many Testimonials received by H. T. & Co.:—

"*Ardwick Bridge Chemical Works, Manchester, Oct.* 28, 1872.

"Sir,—The 'Universal' Steam Pump obtained from you, and which has been employed during the last six months pumping caustic soda at these works, still continues working satisfactorily. "Yours truly,

(Signed) "PETER HART, *Manager.*"

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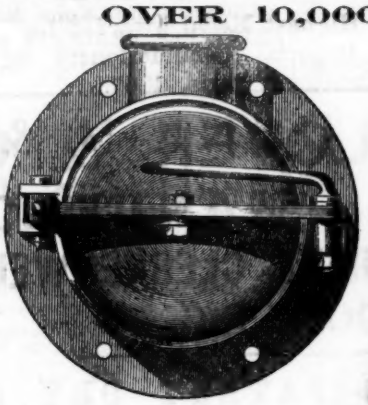
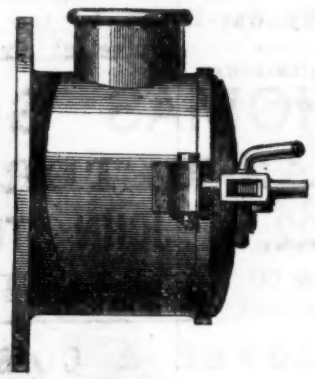


FRONT VIEW.



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DURABLE.

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

These Lids are Adopted by the following (among many other) Gas Companies:—

The Gaslight Company, Beckton (where over 2000 are in use).	The West Ham Gas Company.	The Salford Corporation Gas-Works.	The Carmarthen Gas-Works.
„ Gaslight Company, Bow Common.	„ Imperial Gaslight Company.	„ Rochdale Corporation Gas-Works.	„ Merthyr Tydfil Gas-Works.
„ London Gaslight Company.	„ Gas-Works, Arsenal, Woolwich.	„ Liverpool United Gas-Works.	„ Ystrad Gas-Works.
„ Independent Gaslight Company.	„ Commercial Gas Company.	„ Birkenhead Gas-Works.	„ St. Alban's Gas-Works.
„ Phœnix Gaslight Company.	„ Alliance and Dublin Gas-Works.	„ Birmingham Gas-Works.	„ Over Darwen Gas-Works.
„ South Metropolitan Gaslight Co.	„ Edinburgh Gas-Works.	„ Nottingham Gas-Works.	„ Aylesbury Gas-Works.
	„ Manchester Corporatn. Gas-Works.	„ Newcastle-on-Tyne Gas-Works.	„ Cardiff Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

The following important Testimonial has been given:—

THE GASLIGHT AND COKE COMPANY

(Commonly called the Chartered Gas Company),

MESSRS. TANGYE BROTHERS AND HOLMAN. *Beckton, North Woolwich, July 2,* 1874.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,

(Signed) G. C. TREWBY.

P.S.—We shall have very shortly about 3000 of your Lids in use.

VIENNA EXHIBITION, 1873.—The highest prize and only Medal "for Progress" for Direct-Acting Steam Pumps for general purposes was awarded to TANGYE BROTHERS AND HOLMAN, for

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

4000 have been sold since their introduction in 1867.

In use in over Eighty Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

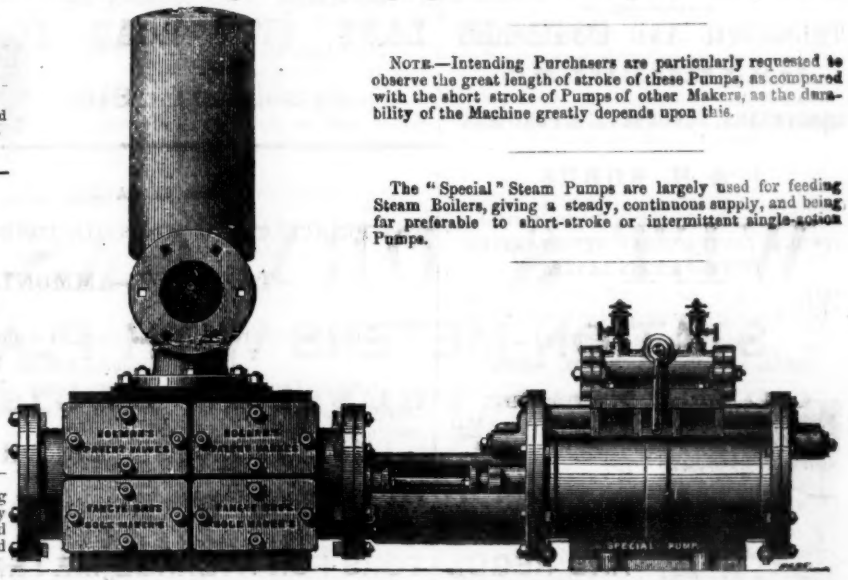
The following are a few of the leading Sizes:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	550	£16
4*	2	9	970	18
3	3	9	2,200	18
4*	3	12	2,200	20
6*	3	12	2,200	25
4	4	12	3,900	25
6*	4	12	3,900	30
6	5	12	6,100	35
7*	5	12	6,100	40
6	6	12	8,800	40
8*	6	12	8,800	50
7	7	12	11,900	50
10*	7	12	11,900	65
8	8	18	15,660	65
10	8	18	15,660	75
10	10	24	24,400	100

* These sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance piece between steam and pump cylinder at a small extra cost.

NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The "Special" Steam Pumps are largely used for feeding Steam Boilers, giving a steady, continuous supply, and being far preferable to short-stroke or intermittent single-action Pumps.



As a Stationary Fire-Engine, the "Special" Steam Pump is unequalled, and, at no great additional expense, those intended for use in Gas-Works may be proportioned so that, in addition to the ordinary work of pumping, they are available for use at any moment a fire may occur, either by day or night.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

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WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, DECEMBER 22, 1874.

Circular to Gas Companies.

A THING that strikes us as most remarkable, and worthy of notice at the present crisis, as we are bound to call it, is the complete apathy of the public on the gas question. Violent denunciations of the companies, mingled with the most audacious falsehoods and the grossest ignorance, printed in the cheap weekly papers, do not create any excitement. Inflammatory harangues, warmly spiced with mendacity, at sparsely-attended public meetings, the audience at these being for the greater part non-consumers of gas, fail to produce more than a futile resolution and a vote of thanks. And even these meetings are not found to pay the agitators who get them up. Great as the grievance is alleged to be, the sufferers are not at all inclined to pay a small subscription, which, it is promised, will relieve them of the burden. It is, perhaps, only natural that all but perfect beings should have a sense of injustice done to them when they are compelled to pay anything to anybody. The baker, who will persistently ignore the fact of a fall in the price of corn in Mark Lane, is a standing grievance. The butcher, who thrives in a most alarming way while a Christmas ox fetches £5 a hundredweight in Copenhagen Fields, is naturally regarded as a common enemy, just as a gas company is. We might go further, and quote instances of trades not unknown to members of our local authorities, the profits of which range from 100 per cent. to 700 or 800 per cent., and even more, but which do not attract so much attention, because the articles dealt in are not exactly necessaries of life. With necessaries people wish to be supplied as cheaply as possible, and we do not blame them, only let them reflect and be reasonable. If they would do so, we are certain that they would quickly come to the conclusion that 10 per cent. is not too much profit in a risky business like gas-making.

But to go back, penny papers and public meetings having failed to produce agitation, it is not to be expected that a shilling pamphlet will have much effect. This form of publication has been much resorted to as a weapon of warfare, but in general it is a conspicuous failure. As a rule, no one is the better for it but the printer, and no one the worse but the author. We may then regard with perfect equanimity the publication in this form of two chapters of a forthcoming book on the government of London, which relate to the gas supply of the metropolis.* The first of these chapters is devoted to a history of the past, and an account of the present condition of the London gas supply. We shall not trouble our readers with a notice of this part. The "history" is, on the whole, fairly accurate, and we shall not quarrel with it. We might quote some passages in which the author strongly reflects on the conduct of the Metropolitan Board of Works, whose obstinacy and inaction rendered the Act of 1860 a comparative failure. But to-day bygones must be bygones, and we prefer to deal with matters as they stand at present, and in the few remarks we have now to make shall notice only the second chapter of the pamphlet.

Passing over the author's preliminary remarks, which are by no means just or true, we come to the following paragraphs:—

"There are several fallacies constantly iterated by the London "gas companies, which it is desirable to enumerate and deal "with.

"1. That the Act of 1860 was a parliamentary contract accepted "by the companies and the public as a solution of the question.

"2. That the companies have, or ever had, a statutory right "to a dividend of 10 per cent., payable by *gas consumers*."

[The author says "*ratepayers*," but ratepayers will only pay as consumers of gas, public or private.]

"3. That in any scheme for purchase the companies capital "must be taken at its present rate.

"4. That we are precluded by legislation from supplying our-"selves."

We shall deal generally with these propositions, and not follow the author over all the ground he traverses. The Act of 1860 bound the companies to supply a certain quality of gas within certain limits of price, and these conditions being fulfilled, it allowed the companies to divide 10 per cent. Here, at all events, is a contract in essence, if not in terms. The Act says to the companies, you shall do such and such things, and then you may divide so much profit. The doings of the companies not having been called in question, it is clear that they have a right to the profit.

But, then, (2) can the profits be considered as guaranteed? Here we have to look for an illustration of what may be meant by a parliamentary guarantee, and we find one, at all events. There is another business, the profits of which are guaranteed by Act of Parliament—and that is pawnbroking. Happily, or unhappily, we are not lawyers, and, circumstances have so far favoured us that, we have had no occasion to make ourselves intimately acquainted with the legislation of the "spout." An Act was passed last year, or the year before, of which we have little knowledge, but we believe we are right in saying that the rate of interest allowed in the recent Act is the same as was allowed by the Act of 1800. That Act fixed the rate of interest at a specified sum. It does not say that the pawnbroker shall not take *less;* but who ever heard of a pawnbroker taking less than his legal interest? In like manner, the Gas-Works Clauses Act, 1847—and therefore the Act of 1860, which incorporates it—says that the gas companies may divide 10 per cent. In plain English, just as the Pawnbrokers Act *guarantees* the profit of the pawnbroker, so does the Gas-Works Clauses Act guarantee the profits of the gas company. There is, however, this difference with regard to all but three companies—the profits must be made with a maximum price fixed by a special Act. The analogy then

* "The Gas Supply of London." Part I., "History and Present Condition of London Gas Supply." Part II., "London Gas Supply in the Future." By Joseph F. B. Firth, Esq., London. Stanford, 1874.

fails. A pawnbroker is, under certain circumstances, *guaranteed* 5000 per cent. per annum on his capital; a gas company is, under any and all circumstances, limited to 10 per cent. We say nothing about the security, as regards which Parliament has given pawnbrokers an immense advantage over gas companies. To sum up in a few words, it may be said that a parliamentary guarantee is simply this: You shall not make more than a certain per centage, which implies that you need not make less.

On the third proposition, "That in any scheme for purchase, "the companies capital must not be taken at its present rate," we have but little to say. We may admit at once that every pound which appears in the capital accounts of the companies is not represented in land, bricks and mortar, and iron. We will go further, and confess to "watering," if by that is meant the conversion of back profits into capital. There is much to be said in justification of this, but just now we rest the defence on the simple legality of the proceeding. More than that, we shall simply point out that gas shares pass from hand to hand, and "watered stock," it is probable, has now been bought for hard cash. Mr. Firth admits that the difficulties in the way of a revision of capital are *almost* insuperable. We assert that any such proceeding is absolutely impossible, and that the capitals of the companies must be taken at the amounts now stated in accounts issued by authority.

The last proposition, "That we (the public) are precluded be legislation from supplying ourselves with gas," we do not care to contest upon paper. Frankly speaking, we know of no absoluty prohibition, while we are well aware that the general opinion of Parliament has been against the competition of what we may call public capital with private enterprise—and for good and sufficient reasons. But this we do say, that if matters at the present crisis are to be pushed to the last extremity, let the local authorities do their worst, and the gas companies are ready to meet them. *Væ victis!* And here, for the moment, we may leave Mr. Firth and his two-chaptered pamphlet.

The Dublin Corporation have recently decided on giving their inspector of public lighting and tester of meters, &c., &c., &c., a salary of £300 a year. One reason—we do not say excuse—for this liberality is, that the officer has, during his probationary year of office, saved the Corporation £312 on the gas accounts. We forget, at this moment, how much a year his predecessor saved the Corporation, but it is perfectly clear that the public lights of Dublin are in a fair way to be supplied for nothing. There is, however, a fear among some people that the ultimate result of the conjoined parsimoniousness and liberality may be darkness in Dublin streets, and, whilst waiting for improvements which the impecuniosity of the Corporation denies, the incident of a cabman driving his fare into the Liffey may be often repeated on a foggy day or a dark night.

The Bill promoted by the Chartered Company has been printed, and will show to the Metropolitan Board and Corporation the ideas the directors entertain as regards the value and selling price of their property. In the first place, however, power is sought to purchase additional lands, apparently for the extension of the Western and Beckton works. No further capital is asked, but it is provided that capital raised under the authority of previous Acts may be applied for the purposes of this Act. Further borrowing powers, as suggested by Mr. Farrer, are asked for, and these powers are only limited to "such sums of "money as may be necessary for the purposes of the under-"taking." The rate of interest on this borrowed money is not to exceed 6 per cent. If the clear profits amount to a larger sum than is necessary to pay 10 per cent., power is sought to apply the excess, to the extent of 1 per cent. per annum on the paid-up capital, to the creation of a fund, which is to be at once an insurance and a reserve fund, equally applicable to meet any extraordinary claim or to make up any deficiency of divisible profit. This fund is not to exceed one-twentieth of the capital, and, whenever it reaches this amount, the interest is to be carried to the fund available for dividend. If anything remains after distributing 10 per cent., and setting aside the 1 per cent. for the above-mentioned fund, it is to be carried to the credit of the divisible profits for the next year. The next section is intended to repeal sections 5, 6, and 7 of the company's Act of 1873, and allow them to spend as much as may be deemed necessary on collier-ships, locomotives, and works for the manufacture of residuals, the dividend on capital so applied being limited only by the general enactment.

The provisions of the Bill which will at the present moment attract the most notice are those which reveal the proposals of the company as regards the transference of the undertaking, and it will be seen that they are very clear and explicit. If the local authorities—meaning, of course, the Metropolitan Board and Corporation—within two years give 12 months notice of their desire to purchase, the company *must* sell. *En revanche*, if the company give a like notice within the same period, the local authorities must buy the undertaking. Thereupon, and in either case, the authorities are required, within six months, to serve a declaration in writing under their common seal, declaring the vesting and transfer of the undertaking to and in the local authorities, from a time therein defined, and the business will be done. After that the authorities may proceed to exercise all the powers of the company. They are to have power to borrow all the money they may deem necessary; and it is to be left for the committee to say whether or not the Public Works Loan Commissioners may lend the money on the security of the income of the authorities, without further security. The authorities are then required to keep revenue and capital accounts, and they may apply their income in carrying on their gas business, in paying interest on their debt, and in providing for its extinction by means of a sinking-fund.

Next come the terms of transfer, which are simply these: In consideration of the transfer, the local authorities shall provide for each shareholder of the company a perpetual annuity, equal in amount to the statutory maximum dividend to which, in respect of the shares held by him, he is entitled. Provision is made for a proportionate reduction in the case of shares, the right of which to participate in full dividends is deferred. We have then some usual provisions for the substitution of annuity certificates for shares, &c., &c.; and the next section we may notice will enact that any shareholder may require the local authorities to provide for him, instead of an annuity, such a sum of money as will, if invested in Government securities, produce an income equal in amount to his statutory maximum dividend, which will be about £285 for every £100 in shares. The assumption of all debts and liabilities of the company by the authorities is then provided for, and also the winding-up of the company.

As regards compensation, the Bill provides that any director may receive, at his option, a lump sum equal to his emoluments during the previous five years, or an annuity for six years (if he should live so long) equal to his emoluments, estimated on the average of the three preceding years. Officers not continued in the service of the authorities are to be entitled to allowances or annuities on the customary scale; but a special provision is made for Mr. J. O. Phillips, the secretary of the company, who, on account of special and valuable services, is considered to be entitled to an annuity equal in amount to the annual amount of the emoluments of his office at the time of the transfer. Officers continued are to receive the same salaries they got from the company, and if increased duties are imposed, they are to have additional pay. Supposing an officer retires, or his services are dispensed with after the transfer, his annuity is to be calculated from his whole time of service, whether with the company or any company amalgamated, or with the authorities. The authorities may, "if they think fit," give to a weekly servant, not employed by them, a gratuity equal to three months pay. Lastly, the costs of the Act are to be paid by the company.

It may be anticipated that this Bill, which places the proposals of the company in contrast with those of the Metropolitan Board and Corporation, will excite much attention. In the main we approve of the provisions. The terms of purchase inserted are the only terms that can be accepted, and we are not at all afraid that Parliament will impose any lower. The general compensations to officers are on the usual scale, which is none too high; and as regards Mr. Phillips, all we can say is, that he has well earned all that his company can get for him.

The Board of Guardians of the Clifton Union have resolved upon an "independent supply" of gas for their workhouse. A proposal to rescind the resolution is to be brought forward at the next meeting of the Board; but there is so much dissatisfaction with the price charged by the Bristol Gas Company, that we think it likely that the resolution of the Board will be confirmed. Then will come the question, How is the necessary capital (£500) to be obtained? and this, we suppose, will have to be settled by the Local Government Board. So far as we remember, no question of a similar kind came before the old Poor-Law Board, and we are curious to know what will be the decision of the Local Government Board. It is a small matter at Clifton; but a great principle is involved.

While feeling the deepest possible sympathy for the sufferers by the Southgate explosion, we may point out that the verdict returned by the jury at the inquest is not at all justified by the evidence. There was nothing before the jury to show that the pipe, which had become broken, was, before the accidental fracture, unfit to convey gas.

We are gratified to observe that the Imperial Government of Brazil, by a dispatch of the Minister of the Empire, dated the 28th of October, 1874, have conferred on Mr. Newbigging, engineer-in-chief of the gas-works, Pernambuco, and editor of the "Gas Manager's Handbook," the distinction of *Cavalleiro da Ordem da Rosa* (Knight of the Order of the Rose), for important services rendered to the country.

Water and Sanitary Notes.

THE gathering which took place, at the invitation of the Society of Arts, to confer as to the best means of preventing the pollution of rivers, we cannot regard as successful. To our minds, it was what the French would call *une affaire manquée*. There were present every man with a scheme, every man with an idea, some with neither, and some with grievances; the council-room was, in fact, a sort of Cave of Adullam. Every one, of course, believed that rivers could be kept pure, so a natural resolution was passed to go to Mr. Disraeli, and tell him that the thing can be, and ought to be done. But, after all, it was not settled how it should be done, and thus we are afraid that the Premier will gain but little enlightenment from his interview with the deputation. He will, probably, be guided, in the production of any measure the Government may propose for the purpose, by the reports of the Rivers Pollution Commissioners. The fifth of these, and, we presume, the last, has, after a long gestation, just appeared. The conclusions of the commissioners will be found in another column, and there can be no doubt that if the recommendations be adopted in any Bill, it will have to encounter very serious opposition.

We publish in another place a paper by Mr. Bailey Denton, suggesting the appointment of another Royal Commission, to be charged with the duty of making a general inquiry into the water supply of England and Wales, and the best means of storing it for use. It certainly does seem curious that, while nature showers water down upon us so bountifully, and while we have such abundant stores laid up for us beneath our feet, such a scarcity should occur as has been experienced in the past autumn. The existence of such a scarcity, we agree with Mr. Denton, is a disgrace to a nation claiming for itself one of the foremost places in civilization and science. Without, however, the adoption of some general plan of water supply, this scarcity must at times be experienced. It is pointed out in the paper, that the greater part of our rainfall is wasted, and the author suggests, as we have more than once, that our water-bearing strata may become exhausted, and some do already show signs of exhaustion. Having in mind, then, the continually increasing wants of our community, no subject of greater importance can occupy the attention of our statesmen. We fully endorse the opinions expressed at the meeting, that steps should be taken to define the watersheds, and to create authorities which should determine, on large and general grounds, the most beneficial appropriation of the water supply. And we will go further, and say that it is highly desirable to stop the scramble for water supplies, and the expensive contests and partial inquiries which occupy so much of the time of parliamentary committees.

At a meeting of the inhabitants of Newcastle, presided over by the mayor, who happens to be a director of the water company, a resolution was carried to the effect "that the water supply to "Newcastle having been for a long time most unsatisfactory in "quantity and quality, it is the opinion of this meeting that the "Town Council, as the sanitary authority, should undertake the "responsibility of supplying such an important essential to the "health of this town." After this it may be supposed that the Town Council will enter into negotiations for the purchase of the undertaking; but it seems they are anxious, first of all, to have an inspector sent down from the Local Government Board to investigate the whole question. That the large views propounded by Mr. Bailey Denton are shared to some extent by the Newcastle Council is shown by the fact that the following resolution was agreed to:—"That this council, being desirous of obtaining an "independent and sufficient supply of pure and wholesome water "for domestic purposes for this borough, do signify their readi- "ness to join to form part of a united water authority, upon such "terms and conditions as may hereafter be defined." That the complaints of the quality of the water are not well founded, we think is clear from the report which has been presented to the Town Council. It stated that—

The Tyne water was 7½° of hardness, and of tap water 17° of hardness. Both samples were free from poisonous metals. In the enclosed report Mr. J. Alfred Wanklyn, the analyst, said the waters were not contaminated with sewage, but both of them were far too highly charged with organic matter (apparently of peaty origin) to be suitable for domestic use. He had no doubt that after filtration they would be found to be sufficiently pure for domestic use. The following were analyses of the two samples of water, marked C and D respectively, which were sent in behalf of the Authority of Newcastle-on-Tyne on the 7th inst.; submitted to analysis, these samples of water gave the following results:—Sample C contained 26 grains of solid matter in solution in one gallon of water, and of this solid matter 1·2 grains were chlorine. In one million parts of water there were 0·14 parts of free ammonia, and 0·15 parts of albuminoid ammonia. Sample D contained 25 grains of solid matter in solution in one gallon of the water, and of this solid matter 1·2 grains were chlorine. From these figures it appears that samples C and D are very similar, if not identical. Both are too highly charged with organic mrtter to be fit for use without filtration. The hardness of these two samples is also alike, —viz., 18°. The sulphuric acid was determined in the samples, and found to be 3·0 grains per gallon in C, and 3·5 grains in D. An experiment on the filtration of C and D was made by passing the water through a small silicated carbon filter, and subsequently analyzing the filtered water, which was found to contain 0·02 parts of free ammonia and 0·03 parts of albuminoid ammonia per million parts of water. This shows that by filtration the water is rendered sufficiently pure for domestic use. Mr. Wanklyn has no doubt that sample A would likewise be purified by filtration, and should be inclined to recommend that sample A should be mixed with the other samples, and the mixture, after filtration, taken to supply the town.

There will, of course, be a strong contest in Parliament next session, the result of which we will not venture to predict; but no doubt the water company would sell their undertaking at a fair price, and this the Newcastle Council seemed disposed to pay.

The Ullswater scheme seems to be set aside for the moment, but more is certain to be heard of it. As regards lead in the water of the lake, a report by Professor Roscoe has been published, which shows that there is none of that metal dissolved in the water, but that there is very finely divided suspended matter, which separates out with difficulty, and in this he finds lead. He infers that, if carefully filtered, the water would be wholesome, and fit for drinking purposes.

The Town Council of Hull have selected a water engineer, but not without some of those unseemly proceedings which so commonly occur when corporate bodies have a place to give away. The Water-Works Committee sent up the names of two candidates for the council to choose from; but their recommendation was at once set aside, and the council elected a third—Mr. David Maxwell, of Dundee—who had not been recommended by the committee.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XLIV.

THE CHEMISTRY OF THE MANUFACTURE AND PURIFICATION OF GAS.

There is one product of the changes that occur in the retort, and are caused by the action of heat on hydrocarbon vapours, which deserves more particular notice—we mean naphthaline. The great French chemist, Dumas, has asserted that this body exists ready formed in coal. Reichenbach, however, to whom we are indebted for elaborate researches on coal, denies the truth of Dumas's assertion; and recent experiments within our knowledge have failed to confirm the statement of the French chemist. The question may still be considered an open one, but while yet in some sort of doubt as to the existence of naphthaline in coal, we have to look for its origin in the decompositions and recompositions which may take place in the retort.

It is to another French chemist, Berthelot, that we owe a lengthened and almost exhaustive investigation of the changes which take place when hydrocarbon vapours are passed through a porcelain tube heated to redness. And here the reader will not fail to remark the similarity of the experimental conditions with those which actually obtain in the manufacture of gas. A "through" retort is, in fact, a tube heated to redness; and if we imagine a stopped ascension-pipe at one end (not an unusual circumstance), it is clear that the gases and vapours first evolved will have to traverse a greater or less length of tube, exposed to all the conditions which will favour their decomposition.

Among the constituents of coal gas, as stated by Dr. Hofmann (*ante*, p. 759), will be found toluol, xylol, and cumol. Berthelot has passed the vapours of all these bodies through red-hot porcelain tubes, and he has found the following changes to occur:—Toluol ($C_7 H_8$) breaks up to form naphthaline and benzol, with the separation of free hydrogen. In like manner xylol ($C_8 H_{10}$) forms naphthaline and toluol, and uncombined hydrogen is separated. Similarly cumol ($C_9 H_{12}$) yields naphthaline and xylol, with free hydrogen. The law appears to be that the lower and less stable hydrocarbon compounds, under the influence of heat, break up to form a higher and more stable compound with another lower than the derivative, and the elimination of free hydrogen. We quote from Berthelot the equations which represent the changes:

4 Toluol ($C_7 H_8$) = Naphthaline $C_{10} H_8$ + 3 Benzol $C_6 H_6$ + 3 H_2
3 Xylol ($C_8 H_{10}$) = ... + 2 Toluol $C_7 H_8$ + 3 H_2
2 Cumol ($C_9 H_{12}$) = ... + Xylol $C_8 H_{10}$ + 3 H_2

The reader will easily see that all the decompositions here mentioned may proceed simultaneously in different parts of the retort, and that thus, going backwards, the penultimate result will be the production of benzol and naphthaline. As a last effect, the benzol at a high red heat yields free hydrogen and acetylene, with a vapour of a complex character, the nature of which has not yet been fully investigated.

The possible changes, however, do not stop here. Berthelot has further investigated the alterations which occur when different gas and vapours, always present in raw gas, find themselves in the presence of each other in a red-hot tube. He has, for example, mixed olefiant gas with the vapours of benzol, anthracene, and chrysen, and passed them through the tube, and in all cases he finds naphthaline to be produced.

	Olefiant Gas.	Naphthaline.	
* $C_6 H_6$ +	2 $C_2 H_4$ =	$C_{10} H_8$ +	3 H_2
† $C_{14} H_{10}$ +	$C_2 H_4$ =	$C_{10} H_8$ +	$C_6 H_6$*
‡ $C_{18} H_{12}$ +	2 $C_2 H_4$ =	$C_{10} H_8$ +	2 $C_6 H_6$*

We have, in the above-described reactions, the production of

* Benzol. † Anthracene. ‡ Chrysen. As regards this last body, the reader will note that the formula assigned by Berthelot is treble that doubtfully put by Hofmann.

naphthaline amply accounted for, but other sources of origin remain to be noticed.

It has been found that the vapours of bisulphide of carbon, with sulphuretted hydrogen and carbonic acid in contact with iron at a dull red heat, produce naphthaline.

From what has gone before, it is clear that gas is never produced without the formation of some naphthaline, and that the common belief is a true one—that the higher the heat, the greater is the production. It is, in fact, the troublesome accompaniment of poor gas, in the manufacture of which, quality has been sacrificed for quantity. The practical sagacity of gas engineers has taught them how inconvenience from the presence of this body may be avoided. The chief characteristic of naphthaline may be said to be its pre-eminent solubility. It is soluble to any extent in liquid hydrocarbons, and its vapour is freely soluble in, and is carried along with, vapours of similar bodies. Thus the art of removing naphthaline consists in the slow condensation, whereby the vapours are kept together until a point of what we may call supersaturation is reached, at which deposition takes place, leaving so much as can be retained in solution by the vapours of benzol, &c., to pass on to the consumer's burner. It is a valuable illuminant, and, therefore, the retention of as much as possible is desirable.*

One other inevitable constituent of coal gas, the presence of which causes much trouble and anxiety to the manufacturer, requires to be noticed; this is bisulphide of carbon. The presence of uncombined sulphur in coal is, we have said before, a matter of conjecture. What is certain is, that in all coal there is more or less of iron pyrites, which is composed of two equivalents of sulphur to one equivalent of iron—or, in other words, is bisulphide of iron. By the action of heat, one of the equivalents of sulphur is easily detached, and the sulphur thus liberated coming in contact with carbon, union takes place, and the result is the production of what we know as bisulphide of carbon. It is commonly said to be a product of extreme heat; but the truth of the statement is by no means well established. The probabilities are that its formation goes on regularly all through a charge, such pyrites as may exist on the surface being first decomposed, and what may be contained in the interior giving up its sulphur as it is reached by the heat. The idea that the bisulphide is a consequence of a high heat seems to us to depend on a conjecture that, at an extreme temperature, the protosulphide of iron which is left, when one equivalent of sulphur is driven from the bisulphide, is decomposed. But for this re-action water is required, evidence for the presence of which is wanting. Moreover, it is a well-known fact that the coke obtained when coal is distilled "dead off," still yields, when burnt in an open grate, a large quantity of sulphurous acid, proving clearly that protosulphide of iron has remained undecomposed. The preceding remarks as to the efficacy of slow condensation in the removal of naphthaline apply equally to the removal of bisulphide of carbon. It is a well-established fact that much of this obnoxious body may be taken from the gas by prolonged contact with tarry vapour, and more especially with sulphide of ammonium.

(To be continued.)

Death of the Chairman of the Ratcliff Gas Company.—Mr. John Ebenezer Bromley, who had filled the office of director of the Ratcliff Gas Company for a period of 27 years, died on the 5th inst., in the 68th year of his age Mr. Bromley was appointed chairman of the company, at the latter end of 1872. on the death of Mr. Andrew Wilson.

Proposed New Water-Works for Liverpool.—The present and prospective wants of Liverpool suggest the necessity of providing an increased water supply for the borough and the large surrounding district which the corporation are bound to supply. Originally Liverpool was dependent on the water pumped from the wells in the immediate vicinity of the town; but as the population increased this source was found to be insufficient. The corporation thereupon obtained parliamentary powers to construct immense reservoirs to catch the rainfall of the Rivington Hills, near Bolton, and it is not too much to say that although the Pike has yielded abundant supplies of good water, it has proved a disappointment, both as regards expense and sufficiency. An undue proportion of the water was required to be given to the millowners and others, whose rights were supposed to be impaired by the works, and these compensation streams have been gradually bought up at a serious expense to the ratepayers. The works have also been enlarged from time to time—an enormous reservoir on the Yarrow, intended to catch storm overflows, is now approaching completion—but with all these enlargements the corporation are brought face to face with the necessity of providing new sources of supply. The population at present supplied with water, not voluntarily, but under legialative obligation, is about 640,000 persons; ten years hence the actuarial computation places it at 850,000 people, with a progressive ratio of increase in each succeeding decade. The present supply of water is little more than sufficient for present requirements, and if the existing works are extended to their utmost capacity they will be unequal to the wants of the community ten years hence. Further delay is therefore injudicious, and as the problem can no longer be shirked with safety, the Water Committee are well advised in gathering information on the subject. To this end they have already devoted much time and industry, and have "prospected" in many fields. Mr. Jackson, the committee's regular engineer, has made a survey of all the districts contemplated by the late Mr. Duncan, and has discovered a new one which he prefers to them all, namely, that known as the Bleasdale scheme. The committee have subsequently employed the two hydraulic engineers of highest status in the profession—Mr. T. Hawksley and Mr. John Frederic Bateman—to make independent examinations and to advise the corporation both as to the wisdom of Mr. Jackson's recommendations and as to the possibility of obtaining a supply from other regions. We are afraid, however, that the reports of Messrs. Hawksley and Bateman will hardly assist the committee towards an immediate decision, for engineers, like doctors, are apt to differ; they do so in this instance. Mr. Hawksley recommends the valley of the river Wyre, near Bleasdale, as the best source of supply, while Mr. Bateman advises the corporation to go to the lakes Ullswater and Haweswater, in which latter project he thinks that Liverpool and Manchester might combine for the procuring of a practically unlimited supply of good water for both towns.—*Liverpool Courier.*

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* The reader may be referred here to some papers read, and a valuable discussion, at the last meeting of the British Association of Gas Managers.—See Journal of Gas Lighting, &c., vol. xxiv., p. 53 *et seq.*

CARBONIC ACID AND TERMINAL GUARD PURIFIERS AT THE BECKTON GAS-WORKS.

Those of our readers who possess the book entitled, "Description of the Beckton Gas-Works, with Selections from the Working Drawings, prepared by F. J. Evans, Esq., M.I.C.E.,"* will probably have noticed in the general plan of the works, contract drawing No. 1, two small circles about ⅛-inch diameter, marked "Purifiers," on the left-hand side of the plan. When Mr. Evans designed the Beckton works, he intended using two of the large purifiers we have engraved this week as terminal or guard purifiers, at the outlet of the works, to guard against the passage of any foul gas into the trunk mains leading to London. Subsequently he changed the contemplated site of these large purifiers, and arranged for two of them to be placed in the open space, shown on the general plan, between the purifying-houses and the retort-house on one side, and two between the purifying-house and the slope on the other side.

As the works became developed, and the question of a more perfect purification from sulphur compounds other than sulphuretted hydrogen arose, Mr. Evans decided to have two similar large purifiers erected for each purifying-house, for the purpose of purifying the gas from carbonic acid, before it entered the purifying-house proper, for the ordinary stage of the purification. These two large purifiers, called "carbonates," in the technical language of Beckton, were designed by Mr. Evans to be used for the purification of gas from carbonic acid exclusively. The impure gas, therefore, coming from the scrubbers, enters these large purifiers first, thence into the purifying-house, and the operation of finishing the purification is completed in two similar large purifiers. The existence of carbonic acid at Beckton is jealously guarded against. At the appearance of the faintest trace of this impurity the purifiers are instantly changed, not only on account of its deteriorating influence on the illuminating properties of gas, but also because of its effect in weakening the materials in the after purification from sulphur.

Our engravings (fig. 1) show an elevation of the purifier, with the cover down, at work.

Fig. 2, an elevation, with the cover raised, for changing the purifying materials.

Fig. 3, a plan showing the purifiers with the cover broken, and the grids and bearing-bars inside.

The dimensions of these purifiers are 41 feet 6 inches inside diameter, and 6 feet deep. The water-lutes are 2 feet 6 inches deep. The thickness of metal all over is ¾ inch. There are four tiers of wood grids in each, as shown on the plan. The T-iron bearing-bars are 4 by 3 by ½ inch, carried right across the purifier upon cast-iron vertical standards, placed at frequent intervals, so that the grids are very firm, and without motion at the passage of the gas, or in being walked upon.

The purifiers are supported on a framing of cast-iron girders, resting upon six substantial brick piers, carried down about 25 feet deep to a solid foundation. To the sides of the purifier, and bolted to the same, there are eight substantial cast-iron standards, which serve as guides for the ascent and descent of the purifier cover. They also support the cover after it has been raised to the required height.

The purifier cover is formed of plates ¼ inch thick on the sides, and ⅛ inch thick on the top, and is lifted by hydraulic power in the centre. By an ingenious and careful calculation of strains, the framing of these covers is constructed to carry the entire weight of this large diameter when supported only in the centre from the inside.

Drawing fig. 2 shows the cover lifted 7 feet high by the hydraulic cylinder, resembling, in fact, a man lifting his umbrella by the centre stick, which, in most umbrellas, has eight or ten struts, reaching from the centre stick to the ribs. The peculiarity of the covers of the Beckton purifiers is that they are constructed without either struts or tension-rods, which would have been most clumsy and inconvenient to have arranged for. Notwithstanding the absence of everything in the shape of struts or tension-rods, these large covers are raised from the centre inside, as shown on the drawing, without the slightest alteration in form, or bending or buckling in shape.

When the cover, on being lifted, has reached the required height of about 7 feet, wrought-iron slide catches are shot out from the standards, two to each, making 16 supports in all, upon which the cover securely rests, while the men are at work inside. When the cover has been raised to the required height, and landed upon the wrought-iron catches of the standards, it remains at rest for a short time to ventilate the interior by the wind blowing freely through all round. Mr. Evans designed these purifiers so as to be easily filled and emptied, and as the top edge of the sides is level with the ground line, the men are enabled to walk straight into the purifier, and the operations of filling and emptying are accomplished with much facility, there being abundant space all round the purifier for the men to walk in and out.

The area of grid surface in each of these eight purifiers is about 5500 square feet. The grids are of wood, the chief part being of rectangular shape. They are made with side frames of hard wood, so as to enable the grids to have the necessary resistance to bear the firm screwing up of the bolts and nuts which bind them together.

These large purifiers, which were constructed by Messrs. Walker, of Donnington, have well answered the purposes for which they were designed, having large surface areas for gas to flow freely and slowly through, being firm and rigid all over, and capable of being entered, emptied, and filled easily, with excellent ventilation for the men doing the work.

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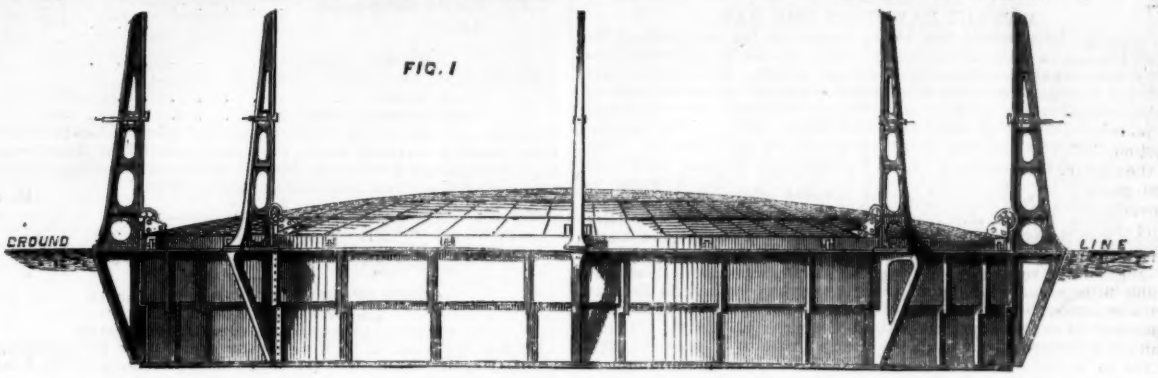
* Published by William B. King, London; now out of print. The general plan of the Beckton works was given as a supplement to the Journal of Gas Lighting for Oct. 26, 1869.

CARBONIC ACID AND TERMINAL GUARD PURIFIERS AT THE BECKTON GAS-WORKS.

FIG. 1



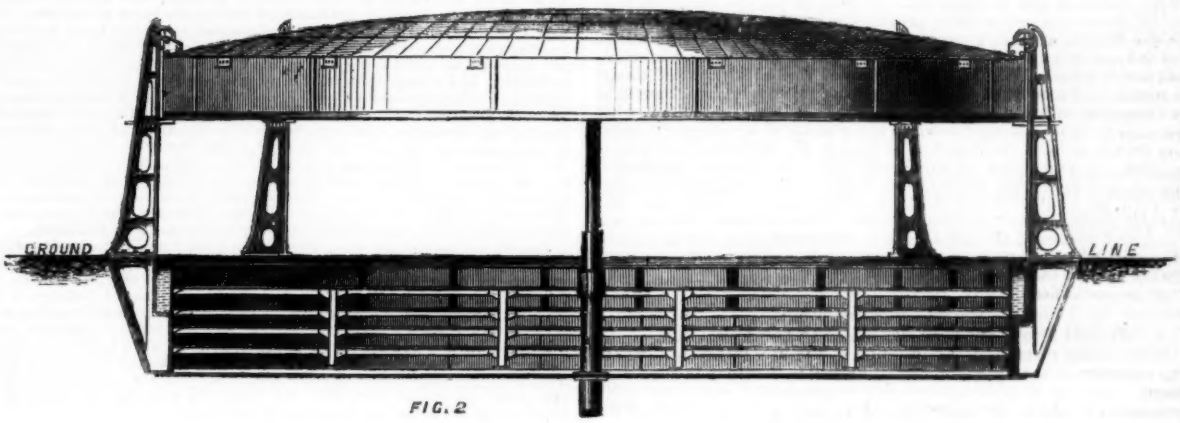
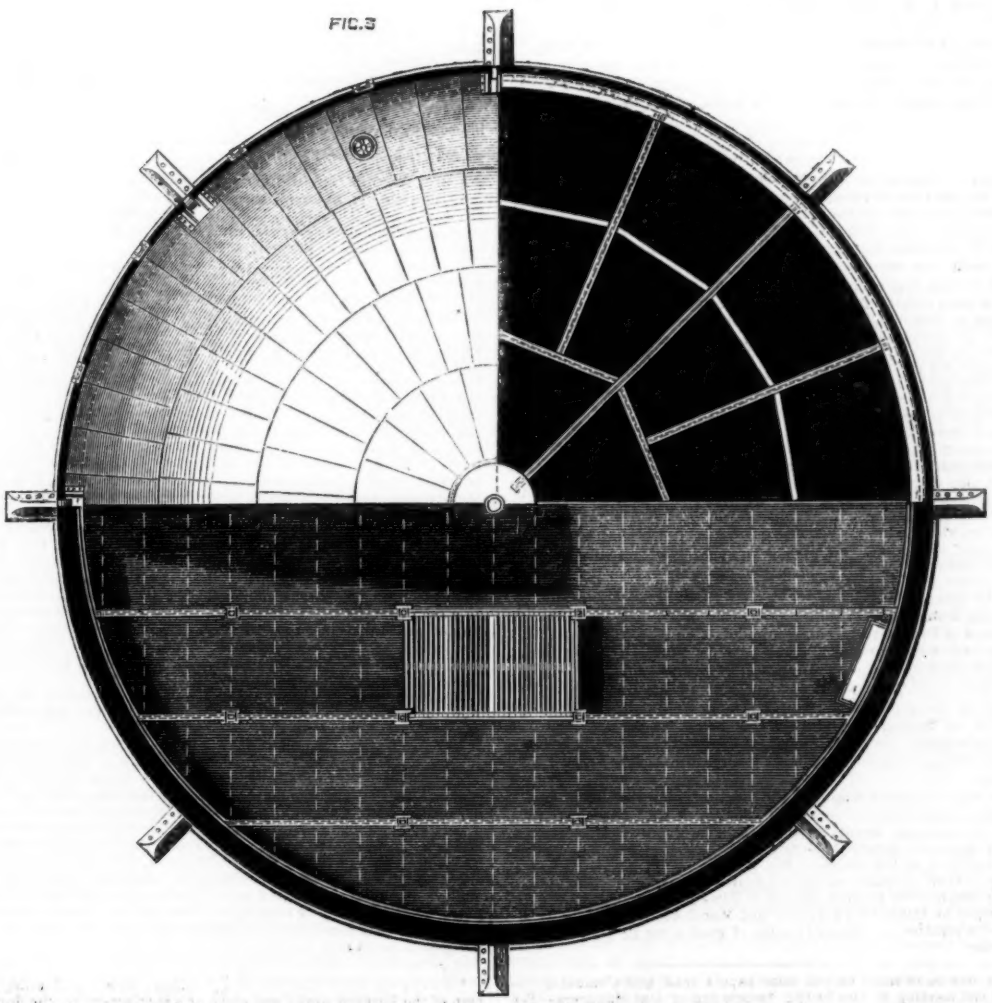


FIG. 2

FIG. 3



Correspondence.

WEEKLY PAYMENTS FOR GAS.

SIR,—In a letter which you kindly inserted in the early part of the year, I pointed out the advantageous results to the Sheppy Gas Company, from the system of supplying fittings on hire. Since then, I have received numerous inquiries from other companies as to the details of the system, as it is adopted by us. We have now nearly 150 consumers so provided with fittings, and have, last summer, acting on your suggestion, commenced supplying cooking-stoves on the same plan, of which we sent out about a score. I expect we shall send out many more next year, as the results, so far, appear very encouraging. But it appears to me, after seven years experience of the method of providing fittings on hire, that a further step may be taken with advantage, especially where there is a large artizan population, as, in my district and many others, the inducements yet offered are insufficent. I am now engaged in endeavouring to arrange a system of supply, which, as well as providing fittings ready for lighting, without any expenditure on the part of the consumer, beyond the rent and payment for the gas consumed, shall include weekly payments instead of quarterly. I have, I think, with the assistance of our engineer, arranged to meet most of the difficulties to be anticipated in such a system. I have been informed, however, that the plan of collecting weekly payments for gas is carried out successfully in the North, but have been unable to obtain any details of the system as now in operation. Will any of your readers, who have experience on the point, kindly give me the benefit of their suggestions? In our district, we have a very fair per centage of consumers, but there are at least 1200 dwellings, rented at 5s. per week and upwards, where gas is not in use. I believe the facilities of the weekly system should induce a good proportion of these to become gas consumers. Instead of gas being looked upon as a *luxury*, only to be secured by the few, what we want to do is to bring it down to the position of a recognized *necessity* for the million. If this is to be done at all, the ordinary system of quarterly accounts must be supplemented by that of weekly payments. The class to be reached has a rooted objection to the payment of sums of even 5s. or 10s. at one demand. That hindrance overcome, the natural antipathy to "trouble," which is also a characteristic of the class, will commend the use of gas to thousands who are at present strangers to its economy, convenience, and comfort, so far as their own homes are concerned.

Sheerness-on-Sea, Dec. 17, 1874. A. W. MARKS, Secretary.

DISCHARGE OF GAS REFUSE INTO A SEWER.

SIR,—I have to request the insertion of the accompanying letter to the secretary of the Crystal Palace District Gas Company in your next issue.

I should not have desired to intrude upon your columns had not the secretary, in forwarding Dr. Letheby's report for publication in your JOURNAL, thought it necessary to state that he had sent a copy of it to this board. SAMUEL EDWARDS, Clerk to the Board.

The Board of Works for the Lewisham District, Dec. 19, 1874.

The Board of Works for the Lewisham District, Dec. 19, 1874.

Dear SIR,—I beg to inform you that your letter of the 8th inst., forwarding a copy of Dr. Letheby's report to your company, on the question of drainage from their works into the main sewer, was laid before this board at their meeting on Wednesday last; their attention was at the same time called to the publication of the report in the JOURNAL OF GAS LIGHTING, and to your letter to the editor therewith.

I am to state, in reply, that the extremely offensive and exceptional character of the nuisance recently occasioned by your company, having been established, by what the magistrate characterized as "irresistible" evidence at the Greenwich Police Court, notwithstanding your own and your manager's negative testimony, and the nuisance having ceased immediately upon the summonses by the Metropolitan Board being served upon the company, and notice to them of an intended application by this board to the Court of Chancery for an injunction against them, this board deem it inexpedient to take any further action in the matter.

I am, however, at the same time, to inform you that this board are prepared, by independent evidence, to prove that the liquid recently flowing for several days from the company's drains into the sewer was such as could not possibly be mistaken, by any person of the least experience, for what you assure the Editor of the JOURNAL OF GAS LIGHTING it was—viz., "ordinary sewage, *slightly* contaminated with *surface drainage* from the works"—and also that this board are prepared, if desired by the company, to submit samples of the liquid for examination by any chemist on their behalf, in conjunction with Mr. Heisch, who has advised the board professionally throughout the matter.

I am, dear Sir, yours faithfully,

SAMUEL EDWARDS, Clerk to the Board.

To the Secretary of the Crystal Palace District Gas Company.

FROME WATER SUPPLY.

SIR,—I noticed in your last impression but one of the JOURNAL OF GAS LIGHTING a reference to the above, and as I am the engineer acting for the town authorities in the matter, perhaps you will allow me to supply you with a little further information upon the subject.

For some time past the Local Board of Frome have had numerous complaints as to the state of the water supply in the town, and their medical officer of health has shown that the need of an improved supply is most urgent. In consequence of the medical officer's reports, the Local Government Board have been urging the Frome Local Board to take action.

The latter body includes some of the leading manufacturers in the town, and other gentlemen of good position, and the board have been quite willing to construct water-works, and have given the subject their constant and careful attention for fully twelve months. This has resulted in an application to Parliament for power to construct works which would afford a supply for all purposes—including manufacturing, which is an important element in Frome—by gravitation, at a total cost of about 35s. per head.

The Municipal Corporations (Borough) Funds Act, 1872, provides that there shall be no part of the expense of proceedings in Parliament charged upon the rates without the consent of the ratepayers at a public meeting, and, if demanded, by a poll. In this case the meeting was held, and was in favour of the project. A poll was demanded, with the following result:—

For the water-works	652
Against „	866
Majority against	214

In addition to the above there were—

Blank papers	275
Papers informally filled up	340

Therefore, a water supply, which the medical officer of health reports is most urgently required, which the Local Government Board says is urgently needed, and which the Frome Local Board are willing to provide, is prevented from being introduced as above stated. H. T.

Dec. 19, 1874.

Legal Intelligence.

COURT OF CHANCERY.—TUESDAY, DEC. 15.

(*Before Vice-Chancellor* HALL.)

CLEGG *v.* CASTLEFORD LOCAL BOARD OF HEALTH.

Mr. KAY, Q.C., and Mr. W. W. KARSLAKE appeared for the plaintiffs; Mr. EDDIS, Q.C., Mr. WADDY, Q.C. (of the Common Law Bar), and Mr. FRANCIS WEBB for the defendants.

This was a suit to obtain a mandatory injunction compelling the Castleford Local Board to remove an obstruction to a sewer, and seeking damages. Messrs. Clegg, the plaintiffs, are maltsters and owners in fee of a piece of land near Castleford, on which they have built a dwelling-house, three malt-kilns, and some cottages, the drainage of which, until the obstruction complained of was made, passed into a sewer under the control of the Castleford Local Board of Health. In January, 1873, workmen in the employ of the board closed the sewer by placing flag-stones across it, and thus stopped all drainage from the plaintiffs premises, and the bill was immediately filed. The bill alleged that the stoppage was made out of spite, because the plaintiffs had given evidence in a sewage case of *The Attorney-General v. the Castleford Board of Health*. The defendants contended that they were acting within their statutory powers, and the plaintiffs having recently put up the third of their kilns, and thus increased the amount of sewage, that the board, being under injunction in the information not to allow an increase in the flow of sewage matter into a certain watercourse, could not permit Messrs. Clegg to increase their discharge.

The VICE-CHANCELLOR said, though the court would not interfere with a public body in the *bond fide* exercise of parliamentary powers, such a body would be retrained from the unlawful and improper use of those powers. In this case the board had acquiesced for years in allowing the drainage of the plaintiffs premises, and had taken sewage rates from them, and if, which he did not admit, they had a right to prevent the drainage from the third, the newly constructed, kiln from falling into the sewer, that did not give them a right to intercept the whole. He believed the fact was that the defendants, being irritated by the plaintiffs giving evidence against them, had acted in the wanton and outrageous manner they had. An injunction would be granted, with an inquiry as to the damage sustained by Messrs. Clegg.

THURSDAY, DEC. 17.

(*Before the* MASTER OF THE ROLLS.)

Re THE AIR GASLIGHT COMPANY, LIMITED.

Mr. ROXBURGH, Q.C., said, as usual, affidavits had been made at the last moment, and it was desired to cross-examine the deponents. The first appointment that could be had before the examiner was the 15th of January, and under those circumstances he applied that the motion might be postponed until after that date.

His HONOUR granted the application; an offer to have the witnesses examined in court having been refused.

(*Before the* LORD CHANCELLOR *and Lord Justice* JAMES.)

WOOD *v.* THE HARROGATE IMPROVEMENT COMMISSIONERS.

This was an appeal from a decision of Vice-Chancellor Bacon. Mr. FRY, Q.C., Mr. JACKSON, Q.C., and Mr. C. BARBER appeared for the appellants, the Improvement Commissioners; Mr. KAY, Q.C., and Mr. FREELING for the respondents, the plaintiffs in the suit.

It appears that the plaintiff is the lessee of some bleaching-works situated on a stream called the Oak Beck, a little below Know Bridge, near Harrogate. The defendants are the local authorities, who have control over the sewage of the district of High and Low Harrogate. The natural drainage of the district was by three small streams, which united into one called the Coppice Beck, which falls into Oak Beck, some distance above Know Bridge. Prior to 1862 there was no general system of sewers for the district. The commissioners then constructed drains and sewers, the discharge from which found its way into Coppice Beck, and thence into Oak Beck, the water of which became considerably polluted. In May, 1866, Mr. Wood instituted a suit to restrain the commissioners from discharging sewage into Oak Beck, so as to injure his bleaching operations, and for damages. That suit was compromised on the terms of the commissioners paying £580 for damages and the costs of the suit, and agreeing that they would not, after the 31st of March, 1869, cause or permit the drains of the district under their control, or any of them, to discharge into the Coppice Beck or into the Oak Beck any sewage, sewage matters, or foul water whatsoever, or otherwise foul or pollute the water of the Oak Beck. The commissioners procured a piece of land on the bank of Oak Beck, above the point where Coppice Beck falls into it, and used it as a sewage farm; but some sewage, chiefly from the Bath Hospital and a slaughter-house, was still allowed to fall into Coppice Beck; and, as the Vice-Chancellor held on the evidence in this suit, from the sewage farm itself a certain amount of sewage not defecated was allowed to fall into the Oak Beck. This suit was instituted to restrain the commissioners from continuing to pollute the stream. The bill was founded on the agreement. The Vice-Chancellor granted an injunction. The defendants appealed.

The arguments for the appellants having been heard, the court intimated that it was not necessary to hear counsel for the respondent. In giving judgment,

The LORD CHANCELLOR said it appeared to him the result of the agreement of March, 1869, was this: It reduced to certainty the rights of the plaintiff and the obligations of the defendants, and, to all intents and purposes, it gave the plaintiff the same rights against the defendants as if he had obtained an injunction against them, save in this respect—that he could not enforce his rights by attachment or sequestration, but only by means of a suit to compel the performance of the agreement. There could be no question now as to the amount of damage, for the object of such an agreement was to get rid of that question altogether. The question to be determined was simply this: Had the defendants done or permitted any of the things which, by the agreement, they were bound not to do or to permit? The question was still further narrowed by the fact that the defendants had admitted that the result of the system of irrigation which they had adopted was, that the sewage water passed through the piece of land which they used for the purpose into the Oak Beck, and the only question, therefore, was, did the water, in the course of its passage through the land, become so altered in its character as not to be either "sewage, sewage

matter, or foul water?" It was said that the court had to deal with a public body, who had no personal interest in the matter. His lordship was willing to give the defendants credit for a sincere desire to give effect to their agreement. But still it was within the experience of every one that public bodies were anxious, for obvious reasons, to discharge their obligations at the least possible expense. No fault could be found with them for that. But it was the function of the court to determine whether (it might be from motives of laudable economy) the defendants had, in fact, fallen short of their duty. His lordship thought that the evidence showed they had done so. After commenting upon the evidence, his lordship said that the result of it was that the sewage of a town, such as Harrogate, was passed over a shelving surface of 48 acres into the stream which the defendants had agreed not to pollute. It was vain to contend that either the letter or the spirit of the agreement had been carried out. It was further argued that the court, in awarding an injunction, should have regard to the fact that the plaintiff had only a limited interest in the land which he occupied under a lease for a term of years. It was not, however, the practice of the court to continue an injunction in its terms to the period of the plaintiff's interest. If the plaintiff should apply to the court to enforce the injunction after his interest had come to an end, the court would know how to deal with such an application. The appeal must be dismissed.

Lord Justice JAMES concurred.

Mr. FRY asked for an extension for six months of the time for complying with the injunction.

The LORD CHANCELLOR said that the time would be extended to April 1. If the defendants should then ask for a further extension, they must be able to satisfy the court that they had been using the time already given them properly.

FRIDAY, DEC. 18.

(*Before Vice-Chancellor* MALINS.)

EUPION FUEL AND GAS COMPANY.

Mr. GLASSE, Q.C., said he was now in a position to save further trouble in the matter; there would be an order to wind up on both petitions. The order would not only provide for the usual costs, but for those of Mr. Fry.

Mr. HIGGINS, Q.C., appeared for the company, and desired to say that the directors having been committed for trial, it would be perfectly hopeless to attempt to carry on the company under the circumstances.

The VICE-CHANCELLOR: They never had any operations as a company.

Mr. HIGGINS did not wish to go into the matter; but the directors considered the company itself now a very good one. The debts were small: and if it had not been for what had occurred, the directors were prepared to have paid the debts.

One order to wind up was then made on both petitions.

COURT OF COMMON PLEAS.—WEDNESDAY, DEC. 16.

(*Sittings at Nisi Prius, at Guildhall, before Lord* COLERIDGE, *Chief Justice, and a Special Jury.*)

SOUTHWELL AND BRIGGS *v.* BOWDITCH.

Mr. BENJAMIN, Q.C., and Mr. ASPLAND appeared as counsel for the plaintiffs; Mr. COHEN, Q.C., Mr. A. L. SMITH, and Mr. R. PURVIS were for the defendant.

This was an action in which the plaintiffs, merchants in London, sued the defendant, a colonial broker, for the price of five tons of anthracine, which is the distillation of coal tar from which the new colours are made. The facts are these. In May, 1874, a Mr. Blott contracted with Messrs. Meister, Lucius, and Bruning, colour makers, at Hochst, in Germany, to supply a large quantity of anthracine, and in consequence of this applied to the defendant to supply him with five tons, to enable him to complete the performance of his contract with the German merchants. A contract was entered into accordingly on the 5th of May, 1874, the bought and sold notes containing a stipulation that a certain test should be applied to the anthracine before delivery, and also that "all should be made from coal tar." It appeared that two kinds of anthracine are made from coal tar, anthracine proper—the immediate result of coal tar distilled—and pitch anthracine, the residuum of pitch, which is the refuse of anthracine proper again distilled. The defendant's evidence was that the anthracine delivered was pitch anthracine, and that as such it was worthless. It was contended on behalf of the plaintiffs that the test contained in the bought and sold notes applied equally to pitch anthracine as to pure anthracine, and the only other material stipulation in the contract—namely, "all from coal tar"—also applied as much to the one as to the other, and failed to determine the intention of the parties at the time of making the contract. Evidence was also called to prove a custom, that where, as in this case, the principal was undisclosed up to the prompt day, the broker was liable, but his lordship rejected the evidence offered as valueless and insufficient. The counsel for the defendant also submitted that the broker was not liable, in point of law, he having acted on behalf of an undisclosed principal, but his lordship ruled that the broker was liable, he not having signed as broker, although the general tenor of the documents indicated that he acted in such capacity. His lordship reserved leave to the defendant to move on this point, and left the following questions to the jury—first, was the contract fulfilled; second, if not, to what extent, if any, was the pitch anthracine delivered inferior in value to the anthracine contracted for?

The jury found a verdict for the plaintiffs—damages, £325.

COURT OF SESSION, EDINBURGH.

(*Before the* LORD ORDINARY.)

HOG *v.* THE UPHALL MINERAL OIL COMPANY, LIMITED.

This was one of several actions raised to prevent the pollution of the river Almond. The present action was raised in July, 1872, at the instance of Mr. Hog, for the purpose of having it declared that he had undoubted right to have the water of the Beughburn, and the Broxburn below its junction with the Beughburn, so far as these streams flowed through or past his lands, transmitted in a pure state, fit for domestic purposes and for the enjoyment of man and beast, and that the defenders had no right to pollute these streams, or to discharge into them any noxious or impure matter.

The oil company denied that they polluted the water; but after the record was closed they put in a minute admitting that they had caused impurities to be discharged from their works to such an extent as to poliute the water.

The Lord Ordinary, on Jan. 18, 1873, remitted to Mr. Pattinson, engineer, Newcastle, to examine the works, and to report whether they could be so conducted as to prevent in future the pollution of the water, and if so, how. Mr. Pattinson since that made three reports, and the Lord Ordinary thereupon issued an interlocutor, in which he ordered the defendants to execute such works of a permanent character, by the strengthening of the existing drains and the formation of additional drains or otherwise, as might be necessary to prevent the pollution of the Beughburn in time of floods or rainy weather, and remitted back to Mr. Pattinson to see such works as he might deem necessary, executed, and to report. Mr. Pattinson has since submitted a report, and parties were heard thereon.

The LORD ORDINARY declared that the pursuer had good and undoubted right to have the water of the streams transmitted through his property in a pure state, and fit for the enjoyment and use of man and beast, and that the defenders had no right to pollute the water.

MIDDLESBROUGH POLICE COURT.—TUESDAY, DEC. 15.

(*Before the* MAYOR *and other Magistrates.*)

CONNECTING A SERVICE-PIPE WITHOUT CONSENT.

John Wells, a tailor, was charged with unlawfully laying or causing to be laid a certain pipe to communicate with another pipe for conveying gas to his his house, such pipe being the property of the corporation (who are the owners of the gas-works, and the undertakers within the meaning of the Gas-Works Clauses Act, 1847), without their consent, and contrary to the statute.

Mr. *John Booth*, the manager of the gas-works, said the defendant applied at the office on the 3rd of December for a meter to be put up into a house in Newport Road. There having been a large number of similar applications from other people, the meter could not be put in by the time the defendant wanted it. On Monday, the 7th inst., he received by post a letter from the defendant, which was dated the previous Saturday, in which he stated that, "having waited until 6 p.m. for the meter, and you have not sent it, I have joined the pipe to a service-pipe. Please get it completed as soon as possible." That letter he (witness) submitted to the Gas Committee, who ordered this prosecution.

Defendant admitted the facts, and said he had pleaded "Not guilty" so that he might have the decision of the magistrates in the case. He went to the gas-works on Thursday, the 3rd inst., and applied for a meter. His surety was accepted, and the formalities all arranged. He waited until the following Saturday, and, the meter not being put in, he considered that the Gas Committee, having entered into a contract when they had accepted his surety, had neglected to complete that contract in proper time, and that he was perfectly justified in delivering to himself part of what he had contracted for. He thought the quantity he consumed without the meter could be calculated from the quantity he used afterwards. Another point which he wished decided was—and several friends who were in a similar position as himself wished him to get it decided—whether they could be fined in such a case. They were aware the Act stated that a penalty could be imposed for connecting the gas-pipe to the pipes in the house, but the impression was that it only applied to cases where the intention was to defraud. He also wished to bring before the Bench the inconvenience to which the public were subjected in consequence of the Gas Committee not supplying gas in a reasonable time. He did not consider he had committed a breach of the statute.

Mr. WILLIAMS: If you had undertaken to supply goods to another person and failed to meet the contract, would that person be justified in breaking into your shop and taking part of them out?

Mr. WELLS: That would be a different thing—breaking into the shop. I should consider if you entered into a contract with another person to supply a certain quantity of iron, and you failed to deliver that iron, that the other person would be perfectly justified in taking away part of the iron off the premises if he could do so without breaking in.

Mr. WILLIAMS: I think I should send the person to gaol who took away the iron. The law provides a remedy if another does not fulfil his contract, but the law would not justify me breaking into your house and seizing part of the goods.

Mr. WELLS: Breaking into the house is a different thing.

Mr. BOOTH said the defendant would consume about 100 feet of gas, which would cost 4d.

The MAYOR said the defendant was technically wrong, and had committed a breach of the Gas Act, for which he must pay 10s., including costs.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

COURT OF COMMON COUNCIL.

At the Meeting of the City Corporation, on Thursday last—the LORD MAYOR presiding,

Deputy FRY called attention to the proceedings of the Metropolitan Board in reference to the proposed gas legislation of next session. He wished to know whether the terms and conditions of the purchase of the gas companies had been settled by the Gas Committee without giving an opportunity to the court to express an opinion upon them. Also to what extent the corporation had been committed in these terms and conditions.

Mr. SHAW desired that the reference to the Gas Committee should be read, which having been done, he said it would be seen that the committee had not gone beyond their instructions. Nothing had been done to commit the corporation. The question was discussed at many conferences with the Gas Committee and the committee of the Board of Works, and the points agreed upon had been embodied in a bill. There were many subjects left open for discussion, and they would be discussed previously to the bill being presented to a select committee of the House of Commons. The commitee were proceeding carefully, and would not commit the court beyond their intention and their instruction.

Mr. BEDFORD thought the Gas Committee should be instructed to report to the court before committing the corporation to the acts done by the Metropolitan Board.

Mr. SHAW said the committee were only carrying out their instructions. It was in the hands of their officers, and they were acting in conjunction with the officers of the Metropolitan Board. If any question arose, of course the committee would report to the court.

Mr. RUDKIN wished that copies of the bills should be sent to every member of the court.

Mr. SHAW said there was no objection to do so on the part of the committee.

Mr. BONTEMS asked whether, in the event of the works of the gas companies being purchased, the terms had been settled, as well as the portion of the parliamentary expenses to be borne by the corporation. He hoped the committee would report to the court before these matters had been settled.

Mr. SHAW said the terms of purchase had to a certain extent been settled, but the details would be considered in the committee of the House of Commons. As to the expenses, nothing had been settled.

Mr. BONTEMS asked whether they were to understand that the Metropolitan Board of Works had the sole control of the bill.

Mr. SHAW said they had not; there was perfect accord between the Metropolitan Board and the Gas Committee.

Mr. M'GEORGE thought the committee should report upon the provisions of the bill, then a discussion might be raised upon them. This was better than that objections should be based upon what he might term offensive motions.

Mr. H. L. TAYLOR said Mr. M'George had forgotten that this was not a question new to the court. The court had considered the question, and the committee had acted in conformity with the reference to them. They had given every possible attention to it, and had reflected the opinion of the court in what they had done. It was not because they desired to have the power to purchase the companies that the bill had been framed, but because both the Corporation and the Board of Works had been advised that it was no use going to Parliament merely for new regulations. As to the expenses, there would be a difference between those borne by the corporation and those disbursed by the Metropolitan Board. This was quite understood, though the proportionate amounts had not been settled.

Deputy FRY gave notice that at a future court he should call attention to the provisions of the bill.

METROPOLITAN BOARD OF WORKS.—At the weekly meeting, on Friday last, a letter was read from Mr. J. E. Liardet, urging the board not to acquire any ground in the parish of St. Paul, Deptford, for the purpose of erecting gas-works, and stating that land can be obtained on the Essex Marshes on which to construct the anticipated works without injury to the public health, and at the same time effect a great saving in cost, and stating that he is of opinion that a locality should be reserved on the Essex Marshes whereon to carry out all deleterious businesses. The communication was referred to the Works Committee.

GAS EXPLOSION AT SOUTHGATE.

ADJOURNED INQUESTS.

On Monday, Dec. 14, the inquiry into the cause of the deaths of Emma and Helen Kennedy—mother and child—was resumed by Dr. Hardwicke, the coroner for Central Middlesex, at the Railway Hotel, Colney Hatch.

Mr. PECKHAM, solicitor, was present to represent the Southgate Gas Company; Mr. BURNEY, for the owner of the houses destroyed by the explosion of gas on the 3rd inst.; Mr. E. LEWIS, barrister, instructed by Mr. Godwin, solicitor, for the husband and father of the deceased; and Inspector GRAY watched the case for the Commissioners of Police.

James Kennedy was first called and examined by the CORONER. He said: I am a journeyman baker, and, until the explosion, I lived at No. 7, Southgate Avenue. I am the husband of the deceased, Emma Kennedy. On Thursday, Dec. 3, I returned home about six o'clock in the evening, and my wife complained to me of the smell of gas. I smelt something myself, but I thought it was impossible that it should be gas, as we had never had any in the house. I took a candle, and went to the cupboard, where the smell was strongest. I discovered nothing, but I opened the windows and doors before we had our tea. When we had finished, and just as my wife was pouring out some for the children, an explosion took place, and we were blown up suddenly into the air. We seemed to be thrown up to the ceiling, and the floor boards went with us. When we fell, everything—the bricks and boards—fell upon us. When I extricated myself from the heap of rubbish under which I was buried, I saw the gas flaring in the foundations. My wife was dreadfully injured, but I did not see her at the time. I managed to get three of the children out of the ruins, and some one else got a fourth out. I saw my wife afterwards at a neighbour's house. She was insensible, and very much injured about the face. When she could speak she said, "Oh, my poor neck." She was seen by two or three doctors, and was afterwards removed to another room in the house. About an hour afterwards I was taken to the Great Northern Hospital. I was there for a week, but am now discharged. My injuries were a fractured hip and a bruised arm. I had smelt gas for two or three days previously, and my wife was always complaining about the smell of gas in the house. I had not given any notice of it to the company. I thought it was the smell of paraffin.

By the JURY: We had half a pint of paraffin in the house. It was kept in the back kitchen. I thought my wife might have dropped a little when she was filling the lamp. Two or three weeks before the explosion, a baker who was going along the Avenue said he smelt gas.

Edward Atkins, examined by the CORONER.

I am a gardener, and lodged at No. 7 in the Avenue. I was at home at the time of the explosion. I smelt the gas when I came home from work, and spoke about it; but I did not find out where it came from. Roberts (another lodger) looked for it, and went down to Mr. Comper about it. I had been down the garden, and had just returned and was cutting a piece of bread when the explosion took place. I became insensible, and recollect nothing further. Half an hour afterwards I was taken out of the ruins. I had been covered with floor-boards. I did not see any light. I was taken outside into the road. I had smelt gas one day before—on the Wednesday, and a young man who was lodging with me smelt it. I had not heard of gas escaping previously.

By the JURY: I know the difference between the smell of gas and paraffin. I am suffering now from the general shock to my system—from giddiness and the passage of blood. I have been attended by a doctor.

Mr. *Samuel Comper:* I am a gas-fitter, living in the Avenue. On the evening of Thursday, Dec. 3, Mr. Roberts called on me, and asked me to go to his house about a smell something like gas. I was just finishing my tea, and during that interval I heard a sudden burst. We both ran out, and Roberts said, "Oh, that is my house!" When I got to the place, the gas was blazing up the rain-water pipe at the front of the house, the walls of which, and of the adjoining house, were blown down. I went up a ladder, which some one had procured, and put out the fires that were burning in the grates. I also endeavoured to keep the flames from the gas clear of the woodwork. A pickaxe and shovel were obtained, and, with assistance, I opened the ground in the road, in order to cut the main-pipe in two a little higher up the road, in front of some stables. When we had got down a foot or so in depth, we were stopped and told that the gas had been shut off at the works. I had not noticed an escape of gas, nor heard anything of it, till Roberts came for me. I am up and down the road several times a day.

By Mr. LEWIS: I have no doubt at all that what I saw burning was gas. It continued burning from the time I got to the house until it was shut off at the works—it might be ten minutes or a quarter of an hour.

Mr. *James Humfrees*, examined by the CORONER.

I am a gas engineer, and reside in Church Street, Paddington. I have had large works to do, and have had much experience with gas. I was requested by the jury to come down and look at this main. I came first on Tuesday, the 8th, and proceeded to make an examination as far as I was able. I first of all examined the spot where the explosion is supposed to have been. I also made inquiries concerning the drains both in the front and back of the houses. A portion of ground had been opened and filled in again, in the road a little higher up, but nothing had been done in front of the house. I went to the stack pipe, and perceived a smell of gas alongside of it, and I dug up handsful of earth about the foundations of the houses. I examined the sinks, as I had been told that the gas came up from the drains. There was only a faint scorching smell at the sinks. The traps were up at the time. As I could discover nothing to account for the explosion, I gave orders for the main to be stripped the following day in my presence, which was done, and I then found that the main, which was 3 inches in diameter, was broken in two. The two portions were sufficiently far apart to allow me to put my knife in the crack. [The fractured pipe was produced.] The upper part of the main had evidently been broken some time, and the effect of the explosion was to break it right across. I believe that gas had been escaping from the main for some time. The ground is hollow in several places—about 7 or 8 inches from the crack in the pipe, and wherever I took up the earth, more especially near these hollow places, I found it saturated with gas. About 18 inches towards the house from the pipe, the ground was hollow, and I opened it out to trace how far it went, but it did not go to the foundations. The gas had evidently travelled along the course of the leaden water-pipe, and penetrated through the cracks of the brickwork at the foundations below the soil. I saw a gentleman there thrust his walking-stick through the brickwork. I believe the gas must have escaped through the loose earth and the foundations. I noticed that the joists were much burnt, as if the gas had been alight for a considerable time.

The CORONER: In laying pipes down, is there any rule as to their being on a firm foundation?

Witness: No rule; but in laying pipes we should lay them solid for their own sakes.

The CORONER: Is there any rule as to the depth at which they should be laid?

Witness: No rule as to depth. These pipes, if anything, were rather deep.

A JUROR: I should like to ask whether this pipe was a sufficient and proper pipe when placed there originally?

Witness: Yes. I think if it had had to go through my hands I should have passed it.

A JUROR: Is it not a sign that it is defective, that it is thick in one part and thin in another?

Witness: We could not tell that till it was cut in two. Where the crack in the pipe was, the ground was very hard, but in 18 inches it had sunk 3 inches; the ground being very soft. The depth at which the pipe was laid was about 1 foot 9 inches. I do not think a waggon going over would break it. The fracture in the pipe was very nearly opposite the door of the first house (No. 7).

By Mr. LEWIS: The drains, I am told, are at the backs of the houses. The end of the drain is at the first house. The drains did not do the mischief. The ground is very bad. I should imagine it is made ground.

Mr. LEWIS: In laying gas-pipes I take it for granted that the work should be superintended by a man of experience?

Witness: Yes, there should be a proper person to see to it.

Mr. LEWIS: Is it not essential to lay a regular and incompressible bed for them?

Witness: No. There is no rule to go by. You cannot get a better bed for a pipe than a soft bed, if the earth is well rammed in all round. The earth is more likely to be hollow at the joints than in the centre of the pipes, because there it has to be dug out for the men to work with their hands. This fracture was about 3 feet from the joint. The water-pipes here are above the gas-pipe, and they cross it at one point.

Mr. LEWIS: According to good gas engineering, ought not the gas-pipe to be carried above the water-pipe?

Witness: The water-pipe was laid down afterwards. They ought to be laid above, but the gas and water companies do not always carry that out. The water-pipe here is about a foot from the gas-pipe. There must have been a very large quantity of gas escaping to cause this explosion, and it must have been escaping some time.

Mr. LEWIS: Ought there not to be a register kept at the gas-works of all unaccounted-for gas?

Witness: The gas company may be aware that a large quantity is unaccounted for, but not be able to tell where it goes.

Mr. LEWIS: Are gas-pipes tested before they are laid?

Witness: They are tested after they are laid, up to a certain pressure.

Mr. LEWIS: What pressure do you think this pipe ought to be tested up to?

Witness: I could not say.

Mr. LEWIS: Suppose this pipe had been laid originally for a very small gas supply, and subsequently a large gasholder was put up to meet an increased consumption?

Witness: I do not think that would make any difference.

The CORONER: Do you know what mixture of gas with air makes a dangerous explosive mixture?

Witness: No; I do not.

A JUROR: Would it be possible for any gas company to know the quantity of gas wasted until they had examined all their meters?

Witness: No, I think not, until all the meters were taken.

A JUROR: Do you know what was the cause of the first fracture?

Witness: I cannot say what was the cause of the first fracture, but I should say that, being a thin pipe, its own wear and tear might have occasioned it, it having been down some years.

The CORONER: Can you form an idea whether a heavy load going over it might break it?

Witness: It is very possible, it being soft ground. Having seen the ground, I think a heavy load would do it. I should think the old crack was quite half way round the pipe.

The CORONER asked Mr. Peckham whether any one from the gas-works could give information as to when the pipe was laid.

Mr. PECKHAM said the engineer of the company, Mr. Church, was laid up, and not able to be present. He would call the manager.

Mr. *Thomas C. Irish*, examined by the CORONER.

I am the secretary and manager of the gas company, and have been so ever since the formation of the company, 15 years ago. I saw the works all laid out, and the pipes put down. I remember this main being laid. Nos. 1 and 13 in the Avenue were lighted from it. The gas was laid on to those houses in April, 1865. I remember the trench being dug there. I cannot tax my memory—there being so much pipe-laying at the time—but I have no reason to doubt that this pipe was properly filled in. It was tested with a 5-feet gasholder to a pressure of 16 inches, as were the whole of our mains. I never heard any report of leakage from this pipe. We have had reports three or four times, within the last few weeks, of leakage from other pipes through the New River Company undermining us. They go a greater depth than we do, and our pipes are damaged. I cannot call to mind that the ground in the Avenue has been disturbed during my time for sewerage or laying water-pipes. If it had been, we ought to have had notice of it. My instructions from our engineer are to keep 3 or 4 feet away from the water-pipes. I have reason to believe that the gas-pipe in question formed part of the original pipes laid under the first contract by Messrs. Strode and Co. in 1859. Some of those pipes were carted back to the works in 1864, and 139 yards were laid in the Avenue Road in 1865. I had no reason to distrust them. I cannot say how long a main-pipe would last before it was worn out. As a rule, I do not think gas-pipes lie long enough in the ground; they are often obliged to be taken up to make way for larger ones. Our mains generally are sound; it is only an occasional fracture that we have to complain of. Pipes may be damaged by carts going over them. My impression is that the ground here is made ground, and that the vibration by passing trains on the railway may have caused it to settle.

By Mr. LEWIS: This main was put down for the purpose of conveying gas to inflate balloons in the gardens attached to this hotel. Our unaccounted-for gas is about 14 or 15 per cent. Mr. Church is the consulting engineer of the company, and only comes down when he is required.

The CORONER: What amount of gas with atmospheric air forms a dangerous explosive mixture?

Witness: I do not know.

The CORONER: As a matter of information, I may tell you it is three parts of air and one of gas.

Mr. PECKHAM said there was a gas engineer of great experience—Mr. Boulton—present, if it was desired to elicit any information, or the expression of an opinion from him.

The CORONER intimated that he did not think it was necessary.

A JURYMAN remarked that the gas company and their officials had offered every facility for the present inquiry.

The CORONER: So it appears from the evidence.

The jury retired for about an hour, and on their return

The FOREMAN said: Our verdict is that the cause of death arose from an explosion of gas, arising in consequence of a faulty gas-main, the property of the Southgate Gas Company, in front of the house occupied by the deceased.

We wish to add that we are of opinion that the pipes laid down were totally unfit for the purpose of lighting habitations.

The CORONER: I must ask you a question with regard to that, because I must try and find out what your verdict is.

The FOREMAN: That is our verdict.

The CORONER: I was going to ask you whether you think this was an accidental cause, or whether you think there is blame attached to any one—because it is an important point in your verdict.

A JURYMAN: The verdict is upon the one thing—gas. We do not want to go into anything but that.

The CORONER: The question is, what was the cause of death. Was it an accidental cause?

The JURYMAN: We do not put it so.

The CORONER: If you put the remaining portion of your verdict, it is a criminal cause.

The JURYMAN: We wish it to be recorded as it stands. You must imply blame or no blame as you wish.

Another JURYMAN: We all agreed that there was blame.

A third JURYMAN: Not criminal blame. We do not for one moment suppose that these parties were the actual cause of the disaster, but we believe their pipe—the defective pipe—ought not to have been laid down.

The CORONER: The verdict you agree to is—"That Emma Kennedy and Helen Kennedy were found dead, and did die from the mortal effects of shock and injury arising from an explosion of gas escaping from one of the street-mains, the property of the Southgate Gas Company; and the jury further say that the said main was faulty, and totally unfit for the purpose of lighting habitations."

The inquiry then closed.

On Thursday last, Dr. Hardwicke resumed the inquiry at the University College Hospital as to the death of Mary Anne Danes, another of the sufferers from the explosion. The deceased resided at No. 6, Southgate Avenue, the frontage of which was blown out. At the moment of the explosion the deceased was in the front parlour, where she was subsequently found in an insensible state by a man named Prout. She slightly recovered her senses, but was so much injured she was placed in a waggon and brought to the hospital, where she died. The evidence as to the cause of the explosion was repeated, and Mr. Manning, house surgeon, said the deceased was suffering from a compound fracture of both legs and internal injuries, of which she died the following day. The jury returned the following verdict:—"That the death was caused by an explosion of gas from a defective main belonging to the Southgate Gas Company; but there was not sufficient evidence to show how such defect originated."

AMERICAN GASLIGHT ASSOCIATION.

The Second Annual Meeting of this Association was held at the Polytechnic Institute, Brooklyn, N. Y., on Wednesday, the 21st of October last—General CHARLES ROOME (the president) in the chair.

There were nearly 80 members present, representing the following States:—California, Connecticut, Delaware, Georgia, Indiana, Iowa, Massachusetts, Michigan, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Virginia, and the district of Columbia. Canada was also represented by Mr. E. S. Cathels, of Montreal; and Messrs. Littlehales and Gates, of Hamilton.

The SECRETARY (Mr. De Mill) having read the minutes of the last meeting, which, with certain amendments, were approved,

The PRESIDENT introduced the business of the session. After referring to the impaired state of his health, which had prevented the preparation of a formal address, he proceeded to direct attention to the objects of the association. He asked—Who are we? What are we? And why are we associated? According to the constitution as it exists, we are to meet for the purpose of consulting together that we may advance the interest in which we are all so deeply interested—an interest, the object of which is to promote the welfare of mankind and the comfort of every one. That which was years ago a luxury has become now almost a matter of prime necessity. Our business is purely a scientific one. It is reduced to mathematical certainty. Experiments are made, and costly experiments they are, as you well know. Our object is, therefore, to benefit those for whom we work, and upon whom we depend. According to our constitution we are each to tell the other what we know of the business—we are to have no secrets each from the other. Our works are open to public inspection, and the experiments we make, and which may be recorded here, are the common property of this association and all who who sustain it. Our object, therefore, is a good one. Of course we are not, and do not pretend to be, a charitable association. We are spending our own money; we are devoting our time and our studies for what? That we may receive a fair return for that which we invest, and at the same time it is to the interest of the public to sustain us, for in sustaining us they are promoting their own comfort. It is not an antagonistic business. It is a business the prosperity of which depends altogether upon the manner in which it is managed. If it is mere guess work, empirical, it will amount to nothing. That day has gone by in our business. The time has come when all we do must be mathematically demonstrated, and so we provide at great expense, in our works, the means of ascertaining that which will produce the best light for the public at the cheapest cost to us, and, consequently, cheapest to them. Our interests and those of the public are identical. There is, as you all know, a strong prejudice against any chartered company, newspaper editors and reporters especially having no mercy on such a corporation. They call them monopolies. Now, there is not the first feature of a monopoly in our business. In the State of New York any five men can in 20 minutes form a gas company, and getting the consent of the local authorities, can lay their gas-pipes anywhere. Is there any monopoly in this? And yet these gentlemen are pleased to call us monopolists. Gentlemen, we are engaged in a laudable, honourable, and useful business. We are engaged in a business which must succeed. The world cannot do without it, and we must so manage it that we may gain credit to ourselves. We are trustees. Millions on millions of dollars are entrusted to our care. We must manage carefully, or our offices will be taken from us, and we must do as wise and honest men should do, discharging a sacred trust to those whose means are placed in our hands, and to the public on whose favour we depend. We propose to collect, for the information of the members, the laws of the different States applicable to our profession, to enlighten legislative committees and others interested as to the real nature of our business and the modes of conducting it; and although we shall be compelled to repeat over and over again the same old story, we must be patient, for the charges against us are stereotyped, and arise from ignorance of those who, not possessing the necessary scientific information, are incapable of understanding what they undertake to condemn. I have been before committees of Legislatures and of Congress, and for the last 30 or 40 years have had to answer the same old charges, and with the same arguments; and so it will be with you, gentlemen, wherever you may go, and as long as you may live. "*Magna est veritas et prevalebit.*" Truth will prevail. But you can make it known only by incessant labour. You must not grow weary. You must listen to the same old story. "My bill was highest when I burned the least. There is no evidence whatever that I burned this gas; your meters amount to nothing." Gentlemen, has not the law thrown around the consumers every protection which can be given? Are we not compelled to use the measure which the State inspector declares to be a correct measure? And do we not know among ourselves that there is no article of commerce which is more accurately measured and supplied to the public than illuminating gas. Gold and silver are not more carefully dealt out to them than the gas which is burned in the houses and places of business in this and every other city. We know it. Our customers frequently doubt it. How, then, can we convince them? What evidence can we give—what security can we afford? There is a gentleman on this floor who was one of those who framed the law which was adopted by the State of New York, and which gave to the public every possible protection. I know the gas-meter is a correct measure. I have proved hundreds of meters with my own hands when I was the engineer of my company years ago, and I can say as you can say, without fear of contradiction, that there is no measure on the face of the earth more accurate than the gas-meter which is used by the gas companies of the United States this minute. Gentlemen, ours is a progressive science. It is idle for us to sit down and say that all we have to do is simply to throw the coal into the retorts and take the gas out. Ours is a business which requires a study, and the possession of scientific knowledge. That scientific knowledge we are labouring to possess. We pay for intellect and we use intellect, and the public, as well as ourselves, get the benefit of it. It is to our interest to sell gas at as low a rate as we can afford. "Reduction in price causes increased consumption; increased consumption produces increased profits; increased profits enable prices again to be reduced, thereby benefiting both producer and consumer." It is a system of mutual dependence between gas companies and gas consumers. I was somewhat old in the business before many of you were born, for it is now 37 years since I commenced my profession. Gas was then sold in this city for 10 dols. per 1000 cubic feet. We make more money at 2·75 dols. per 1000 feet than we made at 10 dols. Why is this? Because of improvements in our mode of manufacture. I do not know that it is necessary for me to say anything further than this. Scientific papers will be presented to you. Men here, much younger than I am, who are studying hard, will present their views to you, and aged men who have experience in this business will give you the benefit of their experience. But as we are all working together for the common good—for the good of the companies we represent—and representing the companies for the good of the public at large, we can do so in perfect confidence. Let us have no secrets from each other—no secrets from the public. When we give them light, let us give them all the light we can, whether it is in our mode of management or in the simple burner through which they feel our pulse. Gentlemen, I wish you all success.

The SECRETARY then read several communications and invitations addressed to the association, after which

Mr. NETTLETON brought up from the committee appointed to revise the rules of the association an amended constitution and bye-laws. The first seven articles of the constitution are as follows:—

"I. The name of the association shall be the American Gaslight Association, and its office shall be in the city of New York.

"II. The objects of this association shall be, the promotion and advancement of knowledge, scientific and practical, in matters relating to the construction and management of gas-works and the manufacture, distribution, and consumption of illuminating gas, to the end that its cost may be cheapened and its consumption increased.

"III. The establishment and maintenance of a spirit of fraternity between the members of the association, by social intercourse, and by friendly exchange of information and ideas on the before-mentioned subject matters.

"IV. The inducement and extension of more cordial and friendly relations between the manufacturers of illuminating gas and their patrons, based upon mutuality of interests and a recognition by both of the fact that each have rights which the other should respect.

"V. The members of this association shall consist of two classes—active members, and honorary members.

"VI. To be eligible as an active member, a person must be a president, vice-president, director, treasurer, engineer, consulting engineer, or superintendent of a gas company, or an individual manager of a gas-work, or a person practically skilled in the construction and management of gas-works.

"VII. Honorary members shall be gentlemen whose scientific or practical knowledge in matters relating to the gas industry, and whose efforts and interests in that behalf shall recommend them to the association."

The remaining articles relate to the mode of electing members, the duties of officers, the business of the annual and other meetings, subscriptions, &c.

A committee was appointed to engross the constitution, and the secretary was instructed to transmit a copy to every member.

The SECRETARY intimated his desire to resign the duties of his office, and offered some suggestions with regard to the appointment of his successor, and the arrangements for the conduct of the business of the association.

After some conversation on the point, and the appointment of a committee to examine the accounts of the treasurer, the association "took a recess" in order to partake of a luncheon furnished by the Brooklyn Gas Companies.

At the opening of the afternoon session,

The SECRETARY read the following paper on

SUNDAY LABOUR,

By JAMES H. WALKER, Superintendent and Engineer of the Milwaukee Gaslight Company, Milwaukee, Wisconsin.

The subject of the paper I am about to read to you is one that we think deserves our best and most anxious consideration, especially when we consider the crisis which we have passed through, within the last few years, arising from the contest between labour and capital. We think that as a profession we are more deeply interested in this subject than almost any other class of employers. While gas companies are held by the public to be pre-eminent amongst corporations for their want of soul, yet that same public expect from gas companies a faithful performance of all contracts made with them, particularly as regards an unfailing supply of that light which is now almost indispensable to existence in any town or city. The tailors may tell you the men have struck work and you cannot have your garments, the dressmaker may tell your wife or daughter the same story, and even if the dress were for a wedding, the disappointment would be forgiven. But let the gas company by any such accident, over which they had no control, be unable to supply the needed light, and forgiveness is impossible; they will be pursued in a court of law for damages, which the court will, in its own time, award with a swingeing bill of costs against the company, which will have to pay them.

Now, in order for the future to remove much of that feeling among our workmen which causes these contests of labour and capital, we must consider another question besides the mere question of money wages, and that other question is the subject of this paper.

That question is—Ought the gas-worker to have, like other workmen, his weekly Sabbath of rest from his secular employment?

This question is one of great importance to the moral and mental improvement, and to the physical health and comfort of our *employés*, and moreover to the effective and perfect operation of our gas-works.

We do not wish to plead for any sectarian views of the Sabbath; we would leave every workman to his own conscience as to how he would improve his Sabbath; but we would gain for him, if we could, the full right to have a Sabbath of rest, by abstaining as much as possible from his secular employment on that day, which is the main thing peremptorily and expressly required in the Fourth Commandment. To keep it holy is left to his own conscience, there, as to the way of holiness; but to abstain from work is expressly required.

It would take very little research among medical authorities to prove that continued daily labour all the year round, without weekly intervals of rest, is

a most unwholesome practice. The man who follows his business in such a way, like a bow never unbent, can have no relaxation, and no recuperating spring from unrelaxed toil; the result is that his labour is sickly and languid, and depressing to his whole frame. In such a state it is an utter impossibility that the productiveness of his labour to his employers can be at all equal to the labour of a man who works the same time—say a year—with the proper and necessary intervals of rest and recreation. The latter works with better health and elasticity of spirit, and without the languid and fagged depression of soul and body that comes over the unrested labourer; and the intelligence of the man who has had the Sabbath interval of rest is active and energetic compared to the man's that is sunk into the stupid drowsiness of unrested toil.

On these points, without troubling you with the many eminent medical authorities that might be named, I would confidently refer you to the evidence of John Richard Farre, M.D., of London, "an acute and experienced physician," before a committee of the British House of Commons, appointed in the year 1832 to investigate the effects of labouring seven days in a week, compared with those of labouring only six, and resting one. You will find it in pages 34 to 39 of the "Sabbath Manual," by the Rev. Justin Edwards, D.D., and I think it satisfactorily proves all that need be advanced on the subject, that a man should have his Sabbath of rest, and to render it very desirable, by both employer and *employé*, that the gas-worker should have it.

Again, the man who is wholly occupied for a year without proper intervals of rest and recreation can have no comfort, and, without comfort, his work can never be so productive as that of another who has the proper intervals of recreation, and time to look after the things that pertain to his comfort. The very fact that one likes to be clean and well dressed on a Sunday leads to habits that tend to comfort and health, which, in the majority of cases, are totally unattended to by the workmen that have no Sabbath, or who neglect the Sabbath and unnecessarily work secularly on that holy day.

There are many occupations that require great exertion of body, of muscle, and strength, and were these exertions continued daily for a year without the weekly, or even greater, intervals of bodily rest, they would be destructive of both body and mind, for the health of neither could stand it. The collier, the mason, the bricklayer, the carpenter, the ploughman, the labourer, the digger, the worker in the earth, and the sailor on the seas—if by any of these, and many others, the strain of exertion at their labour was kept up daily for a year without the weekly interval of rest, or in the case of the sailor without frequently greater intervals, the result would be, in the majority of cases, ruined health, weakness, and premature old age.

In the case of the gas-worker it is still more certainly so, for all day he has to work in an artificial and furnace-heated atmosphere, sweating and poking at enormous fires, pulling, lifting, hauling, and shoving at enormous weights of coal and coke, and other materials, with his every faculty of body and mind on the stretch to see and fix all right, so that there be no danger to himself and others; and all this continued from morning till night for six days in the week—so that, when Sunday comes round, he is in a truly fit state to require that rest of body which the Fourth Commandment secures to the industry of mankind.

It is that these useful workers for the general comfort, convenience, beauty, and health of our towns and cities should have, as much as possible, like almost all workers in other employments, a Sabbath day of rest once a week from their secular employment, that we here speak. We know that in many cases it can only, to a certain extent, be gained by having sufficient storeage; but we would have it as much as possible obtained, because it is an indispensable necessity to the health of the workman, and to the greatest profit and usefulness of the works.

There are two contingent arguments—one against and one for—the workman being allowed his Sabbath in gas-works, on which I at present put little stress. My object is to improve the condition of the men we at present have, not to speculate upon the condition of those we may have when Sunday can be kept in gas-works. The opponents of the measure say that no work on Sunday begets dissipation; but the answer to that is—it is not usually the dissipated that work on Sunday or on any other day, if they can help it, and men inclined to dissipation will indulge, whether good and industrious men work on it or not. Therefore, I think this argument for abolishing Sunday with any class of workmen is futile and untenable. Then, again, some think that if you were to put an end to Sunday work, a better class of men, morally and physically, would enter into gas-works. It may in some cases turn out so, but I suspect not to anything like the extent some imagine. The men we have are generally good and excellent at their business, which they have thoroughly learned, and it will not be easy for any new hands soon to supersede them; and why should they be superseded? Grant them the Sabbath, as other workmen in other businesses have, and it will be seen that in intelligence and physical endurance they will generally more than match any men new to the business that can be found; and that, in fact, nothing but the tear and wear of time and age can make room for new men to take their places, just in the same way as in other kinds of work.

It is quite unnecessary in this Christian land to say anything about the means of grace, or of religious, moral, and mental improvement, which the securing to the gas-worker his weekly Sabbath of rest from secular work would in most cases ensure to him. The gas-worker naturally is as ambitious of self-improvement as the workers in other employments; and as we well know that for all the givings of the rich to our churches, still these churches (even fashionable ones) make but a poor show if the givings and presence of the working classes are withdrawn from them; and as there is no class of workmen, if allowed the time, who would not, in proportion to numbers, pay a greater share of attention and support to the religious, moral, and intellectual institutions of the land, it is clear that, if they had that time, the churches, and other institutions for moral and mental edification, would be improved by them, as by other workmen, for their own behoof, as well as for that of their fellow-citizens and fellow-Christians.

There are, indeed, some men in every country who are so given up to covetousness and grasping after riches that they overreach themselves, and labour after their misnamed wealth all the day, and almost half the night, all the year round; and they would have others in their employment do it too, if they could, at the lowest wages and for scarcely thanks, thinking they have done a clever thing when their avarice can screw such service out of a man's necessities. But they are the miserable slaves of filthy lucre, the bigotted and superstitious worshippers of the golden calf, the despised and rejected of all workmen, and with whom no workman, good or bad, will remain one hour longer than his own necessities require.

It is needless to appeal to such as these for a Sabbath for any class of working men. They feel no desire for such a day themselves, and they cannot conceive why any man should require it. But we appeal to all men whom the love of truth inspires, whom religion, morality, and intellect guide in the way of truth and right, and who have any influence or partnership with gas companies and employers of gas-workers, that they use that influence to secure to the gas-worker, as much as possible, the weekly Sabbath of rest from his daily secular toil.

Having given you some theoretical arguments, drawn from general consciousness and experience, in favour of Sabbath rest in gas-works, I will now tell you what my particular experience has been in this matter. And as I have noticed that considerable credit is being given to parties on the other side of the water for being the foremost in the wise and judicious course they have taken in this matter—all honour to them, we say. But we can tell you, gentlemen, that away back 30 years ago a near and respected relative, now deceased, and a manager of gas-works, made it a rule that a portion of his men should always have the Sabbath rest, and that no more work should be done than was absolutely necessary to ensure a sufficient supply of gas. For 20 years we have made it our practice in this country to give all the rest possible, in works we were running, on the Sabbath.

In the fall of 1860 I took charge of the working department of a work in a New England State, making about 100,000 cubic feet per 24 hours. The president, a Christian in every sense of the term, suggested that if it were possible to do without Sunday labour he would be very glad, as he considered it a grievous wrong to compel any man in his employ to do that on the Sabbath which would deprive him of the privileges that he himself enjoyed—namely, of the opportunity to worship God according to the dictates of their conscience—and further, the men's pay was to be the same as if they worked the seven days. Now, gentlemen, I think that if there be honour due to any one in this country, it is to the president of this New England Company for the Christian and liberal manner in which he acted towards the men, setting an example worthy of imitation in this and every other country. His instructions to me were that he wished as little labour done on the Sabbath as possible, and I immediately commenced to carry out his suggestion by reducing the labour (as far as storeage would allow) to the work of one man. My practice was to order heavier charges for the last round on Saturday night. When that was in, all the men were to go home but one, who was instructed by the foreman to fire steadily till a certain hour, then to partially close the dampers and strike off the lids as the charges came off, leaving the lids open just sufficient to allow the gas to pass off. The gang that went off at 6 p.m. on Saturday were instructed at what time they were to come in on Sunday night; the man on duty was informed of this, and his business was to open dampers (one hour before the men came in) shake up fires, and have them in proper condition for cleaning. When the gang came in, their first duty was to clean fires and have them well started before drawing and charging, if circumstances required it. The benches were put in as fast as possible, varying the weight of charges, so as to have them come off about the regular time. I have continued this practice since the above-named date, and the results to myself, and the companies into whose works I have introduced the practice, have been entirely satisfactory, and are as follows:—

1. I have used clay retorts exclusively with and without an exhauster.
2. Their life has been from two to three years working time, and the product per retort (which we think is the proper way to value a retort) has been from 5500 to 6500 cubic feet per 24 hours, with (for the best Pittsburgh or Youghiogheny coal) a yield of from 4·80 to 5·25 cubic feet per pound.
3. The quantity of coke used when laying off is small; but the temperature of the retorts is almost always higher than usual. The gas is rapidly evolved; and, though there may be in old retorts a few leaks, they are quickly stopped, and the yield for the 24 hours is generally up to the average.
4. The men are more attentive to their work—their fires are kept in better condition—consequently, we have better heats and better yields per bench and per pound of coal.
5. They do not require to be so constantly watched and urged on with their work, as, the more gas in the holders by stopping time on Saturday night, the longer they can stay out on the Sabbath.
6. My men have improved both morally and physically, and, when new men are required, a better class can be got.

In conclusion, let me advise you to read carefully the endorsement this matter has received, in a communication to the *American Gaslight Journal* of Aug. 17, by Theobald Forstall, Esq., general superintendent of the New Orleans Gaslight Company. I fully affirm every fact there stated. I would ask you, gentlemen, presidents, directors, and superintendents of gas companies, to give this matter your most serious consideration, as one bearing with much greater force on the successful operating of your works than at first sight appears; and further, in the language used in the inangural address of the president of our sister association in Great Britain, "It can be done, it ought to be done, and the shareholders, directors, and managers who withhold an inalienable right from their fellow-men, which is in their power to bestow, are incurring a responsibility that no man of just and right principles would be willing to bear."

On the conclusion of the reading of this paper, a vote of thanks was tendered to Mr. Walker by the association.

The committee appointed to prepare a list of officers presented the following list:—

President—General Charles Roome, New York.

Vice-Presidents—W. H. Price, Cleveland; Elias H. Leavenworth, Syracuse; Oscar G. Steele, Buffalo.

Secretary—Charles Nettleton, New York.

Treasurer—P. E. De Mill, Detroit.

Finance Committee—John S. Chambers, Trenton; J. P. Harbison, Hartford; George A. M'Ilhenny, Washington.

Executive Committee—W. H. Denison, Pittsburg; George D. Cabot, Lawrence; A. H. Hickenlooper, Cincinnati; Henry Cartwright, Philadelphia; W. H. White, Brooklyn; Henry Stacey, Indianapolis.

Adopted unanimously on the motion of S. Lewis.

The report of the committee was accepted and adopted.

The President: Gentlemen, you have been pleased to reappoint me your presiding officer for the ensuing year. I was in hope that the adoption of a new constitution would relieve me from the cares of office. Perhaps the duties are not very great. The state of my health has been very imperfect for the past year. I have suffered very much, struggled very hard; but still, since you have been pleased to replace me here, I thank you, gratefully thank you, for the confidence reposed in me, and, with God's blessing, I will endeavour to discharge my duty to the utmost of my ability.

Captain William Henry White read a paper on

NAPHTHA: ITS ECONOMY AND VALUE AS A GAS PRODUCER.

Historical Facts from its Discovery to the present Day.

By W. Henry White, Engineer, Citizens Gaslight Company.

In accepting the invitation of the association to prepare a paper upon the use of naphtha in the production of illuminating gas, I was conscious of entering upon a "debateable ground" more haunted by spirits of the past than that of Dale Owen, heaped with the wrecks of past efforts, strewn with the mouldering skeletons of earnest yet faulty endeavours, and marked "dangerous" upon all its wayside sign-posts.

As past failures are not of necessity prophetic of present defeat, it being a natural law that the fairest harvests are reaped from soils torn and fretted by plough and harrow, and enriched by the decay of the residuals of other harvests, I trust I may be able to show you that some worthy results have sprung from many an untoward beginning; and I beg your attention to such thoughts and facts as I shall present upon the subject of this paper—thoughts that are the result of a patient, untiring feeling of my way into a more thorough and practical knowledge of the value of oil gas, and which have crystallized into facts in whose light and on whose uncompromising strength I now presume to address you.

Viewed from the stand-point of our present knowledge of the manufacture of gas from coal, the maximum yield of gas of a good illuminating power appears to have been obtained, further progress being stayed by the inexorable law of a standard illuminating power. Could this barrier be overthrown, the skill of

engineers would doubtless point out methods of obtaining larger yields of gas of low illuminating power from coal.

But this is an insurmountable barrier, and the fact that the standard of illuminating power will be raised rather than lowered, together with the continual call for a reduction in the price of gas to the consumer, bring us inevitably to the question—How can this difficulty be best overcome? Petroleum and its products naturally suggest themselves as the means of escape from this dilemma, they being at once abundant, cheap, more readily obtained, transported, and compactly stored, than the high-priced enriching coals now in use. Considerations touching upon the cost of labour, material, and apparatus may be adduced as enhancing the important claim of this natural oil upon our attention. Still others arise to show the benefits that would accrue from our being thus enabled to lessen the original cost of the plant, and to cheapen and improve the production of gas, thus widening the field of gas industry, and extending to the smaller towns the advantages of this modern necessity.

Enough has been said of late years to call the attention of the capitalist, the scientist, and inventor to this fruitful and fallow field. Indeed, while the earnest searcher for truth in this modern path was but entering into the primary experiments incident to his discoveries, hundreds of charlatans flung themselves into the breach, and have overrun the gas community with undoubted patent specifics for all the ills our industry was popularly judged to be suffering from. Men whose phrenological developments indicated that their enormous "self-esteem, ideality, and acquisitiveness" were far in excess of their "perceptive" and "constructive" faculties, hurried from shop and office with revamped English and continental patents to reform any old fogyism yet lurking in our midst, to worry the suffering "gas man" pale and thin, with the details of processes whose merits were in the vocative case. The Patent Office has been alike the tool and victim of these men, and patent rights have been granted, *ad libitum*, to those who unblushingly appropriated and galvanized into life the dead and buried failures of our gas ancestry, and now offer them to our notice, with an impudence that soars into the region of the sublime, as "my process." I "no further seek his merits to disclose;" you have all met that terrible man who has an important improvement to offer. You have seen the sanguine light of his eyes, heard the unctuous, mellifluous tones of his persuasive accents; have marvelled at his elegantly upholstered exterior; known his anxiety to advance your personal interests, not in the way of a vulgar bribe—oh dear, no, sir, nothing of the sort—only to open up to you the golden vista of years to come, when his patent shall have been adopted, the gas fraternity saved, and you calmly happy, as the richly rewarded instrument of so much good accomplished. Let me turn from this unpleasant body, and look to the other and earnest worker striving for the solution of this problem, and see if—in the tangled skein, a very Peruvian Quippo of woven snais, the confusion worse confounded of so-called oil patents—any good may be brought out of such a chaos.

I will here be for a few moments retrospective. It may be of interest to know that, years ago, even in the infancy of gas-making, oil contended for the palm with coal, so that to-day, as though to prove the weary proverb, "Nothing new under the sun," we have to deal with no new question. Accum and Peckstone, early workers in and writers on gas, give cuts and descriptions of machinery for producing oil gas, and bear testimony that it was a formidable rival of coal gas. It cropped out in subsequent writers, and found supporters in an array of prominent persons and scientists; patents were issued to Messrs. Taylor, Daniell, Hills, and a host of lesser lights, covering the manufacture of gas from resins, fats, oils, naphtha and peat, with all manner of combinations and amusing styles of machinery; nothing of value, unless it was experience, appears to have grown out of all these trials, and failure "marked them for her own." Was the failure inherent in the material, mode of treatment, or lack of proper knowledge on the part of the experimenters? Nobody can tell us, for apparently, no one has taken the trouble to ascertain. The obituaries of those promising schemes were briefly written by Clegg and his immediate predecessors, and looking back to them to-day, with hungry, questioning eyes, we mentally repeat the old obituary upon babes early called from life, "If so quickly you were done for, I wonder what you were begun for," and so unsatisfactorily leave the matter to the wisdom of future generations.

The patentees and inventors immediately preceding the present age seem to have met with no kindlier fate at the hand of fortune, and one scheme after another breaking down, carried with them the hopes of their abettors, and weakened the trust of the gas interest in the ability of any one to produce, in this connexion, a satisfactory method of treating oleaginous matter.

The opportune discovery in this country of the existence of inexhaustible stores of petroleum, however, again naturally attracted attention to oil as a gas producer. It was then there arose that wild helter-skelter of visionary schemes referred to. Another effect of this discovery was to bring to the surface a desire on the part of thoughtful, practical men to put to the test their vague belief, that in some way the old idea of the use of oil might yet be reduced to a practical standpoint. This faith has in one way and another found constant expression among us. The continued experiments of American gas experts proves that the idea of oil gas, though apparently committed to the care of enthusiastic amateurs, had always been working its way with quiet energy into the very inner courts, and now springs into life, here and abroad, with a power and an unquestionable right of position that at once lifts it out of the plane of amateur trifling and professional charlatanry. It had but slumbered, as it were, all these years, and on its awakening makes itself felt in the way and manner of that forceful political unknown quantity, so feared and respected by politicians —"the silent vote"—and, like that, demands consideration.

It would, indeed, be unjust to some did my semi-jocular remarks in opening this paper convey to you the impression that I believed that no man or number of men had earnestly striven for originality in their endeavours to utilize petroleum and its products. Still the fact that they all seemed to cluster around and cling to the essential features of old foreign patents, and could not or would not advance one step beyond and into the unfathomed depths, is indisputable. I have refrained from referring to names in speaking of these patents, as I neither wish to advertise them nor do them injustice; many of their mistakes were at least honest ones, while many men whose training and habits did not entitle them to success in any legitimate business, endeavoured to take advantage of these schemes as a royal road to fortune; hence the whole subject became involved in bad odour, and consequently was long tabooed by all gas companies.

The patents known as the Gale-Rand were really the first American patents to create any degree of attention, and though these contained the vital points of some English and American patents, their experimental trial at Saratoga proved such an advance in the right direction as to form a decided gain, even though admitted, for certain reasons, not to have been a commercial success. There were radical errors in the theory and practice of these patents that have since caused them to be a generally admitted failure. So much enlightenment upon the vexed question of naphtha-gas sprang from the many trials made under these patents, that the gas community were prepared to listen with more tolerance, and investigate with superior skill and upon more accurate data, the claims of subsequent inventors or patentees in the same line, especially as in large areas of our country the enormous cost of coal makes such questions and investigations of great economic importance to those who no longer feel immovably attached to coal as the sole source of gas supply. It is impossible to deny that the results referred to, although not always exact enough for scientific data, still sufficed to indicate that a material difference existed, both as to the quality and economy, in favour of the use of naphtha, as compared with coal, in gas manufacture. These experiments also developed the important evidence that oil gases were of greater value used in combination with coal gas than when used alone. Their great specific gravity and excess of carbon necessitates that they be diluted by some lighter gas, and containing a large per centage of hydrogen.

The diluent used in their experiments was atmospheric air, which was fatal to combustion and deleterious, in adding to an already excessive specific gravity. It was to this point these patents had led us, and in thus opening the way to future investigations, they hold us so far their debtor.

Next in order, I present and consider those granted to Mr. George Olney. Differing in essentials from those of Rand, they gave satisfactory, if not perfect results. In order to mark the difference, I will briefly describe the claims of these patents.

It will be remembered that in the Gale-Rand process, the naphtha in the still was first vaporized, either by the application of direct heat or the use of superheated steam; and the vapours so produced converted into fixed gas by passing them through a heated retort, and subsequently diluting them to the required standard, by the mechanical admixture of atmospheric air at the exhauster or meter. Stratification of this air and the naphtha gas always took place, as no chemical union had or could have taken place between them. The "Olney Process" also makes use of a still in which the naphtha is placed, and heated by ordinary steam to a vaporizing point—the diluent to be used, be it air, water gas, or coal gas of low illuminating power, being forced through the liquor contained in the still. Being thus carburetted, it is then carried to and through the retort, but without carrying any excess of carbon vapours to be converted into lampblack, or wasted as in the former process; the vapours and their diluents are thus converted into a permanent gas as little liable to condensation or stratification, as is gas made alone from coal after the usual processes of purification are completed.

The results obtained from this latter process are a decided improvement over those obtained from its predecessor. The many important improvements that have been embodied in the patent, and the results obtained at the works under my charge, as well as at other works using this process, will, I think, justify me in claiming for it a fair success. As employed in the manufacturing at my works, I make my coal gas of as low illuminating power and obtain as large a yield as possible. A portion of this gas being thus mixed with hydrogen, or, strictly speaking, water gas, is carried to the naphtha works and forced through the stills, where, from chemical affinity, it takes up the naphtha vapours; being thus enriched, it passes through heated retorts, forming a perfect chemical union or permanent gas. Its subsequent treatment is simply that now used in the condensation, &c., of ordinary coal gas.

We have introduced the use of water gas to increase the quantity of diluting hydrogen, thereby lightening the specific gravity and increasing the calorific power of the gas, that the carbon may be properly consumed and give no smoke at the burner. The result has more than justified the experiment.

As this process of manufacture has been in operation at the Citizens Gaslight Company's works for a period of over 18 months, I trust I am able to answer any question or meet any objections of gentlemen present, from actual facts, as demonstrated in our daily working.

Permit me at this point to answer some of the leading objections which have been urged against the use of oil for gas purposes.

1. Such gas must be more liable to condensation than coal gas.
2. Oil gas will stratify in its storeage or distribution.
3. There is a greater loss of illuminating power in the distribution through mains.
4. The greater danger in manufacturing.

These objections have become stereotyped to me, still I cannot but believe them to be the honest doubts of those willing to be convinced, and as such will, in like spirit, answer them.

As to condensation. We have been manufacturing the gas supplied in our district, varying in proportion from one-third to one-half from naphtha, for 18 months. Hence the gas has been subjected in storeage and distribution to all the variations of temperature and change of weather such a period would naturally produce, yet we find no cause to believe that this gas, properly made, is as condensable as coal gas; this must be the fact, since the street drips show a marked decrease in "drip liquor" from what they caught under the old method.

The same facts are substantiated on the question of stratification, none having been observed, though carefully watched for, since we ceased using air as a diluent of the naphtha gas.

The question of loss of illuminating power I have found to be without any foundation. To the eye the gas seemed equally good at all points of distribution. However, not being willing to trust the truth of so important a point to a test so easily led astray, I made repeated photometrical tests of our gas, taken from the mains at various points in the district, on different occasions, in both warm and cold weather, clear and stormy weather, and found in all cases but a trifling variation from that given in the tests made with the gas at the works. The general appearance of the gas in a district supplied, together with the expression of a great majority of consumers, seemingly by nature biassed against any gas company, is no poor test as to its quality; submitted to such tests our gas has proved highly satisfactory.

Regarding the dangerous feature, the general and certainly very natural apprehension is overstrained. The storeage of a large quantity of naphtha in steam-tight iron tanks, properly provided with vent-pipes; its passage through iron tubing, underground, from tank to still, and its final vaporization in a steam-tight iron still, at low temperature and pressure, does seem to reduce the possibilities of danger to *nil*.

As a class we are trained to watch over and protect much more dangerous and exposed portions of our works than any naphtha still or tank can ever be, and have, in the large stores of coal on hand, a lurking enemy ever ready to spring into action.

In a paper that will to a certain degree be public, I question the propriety of, and have, therefore, refrained from giving exact figures or details of cost of manufacture, &c. I cannot but consider such data the property of my company, as constituting the private records of their business. I am, however, free to say that the company, even in days of cheap labour and coal, were never able to produce gas so cheaply or of such quality as it now does. I may further safely say that we put our gas into the holder for one-third less cost than we ever did or could do with coal alone.

These are facts based on our past business, upon which our dividends have been paid, and are in no wise estimates or suppositions.

I do not claim that such results came to us at the outset, neither had the patentee or ourselves a full knowledge of the capabilities of the gas experimented on, nor the experience we may justly claim for our guidance in future efforts; difficulties had to be met, unforeseen obstacles removed, opposing influences counteracted, consumers trained to the change, and ourselves to be educated; the long weary list of vexatious, anxious hours over the many little points that always threaten defeat in the development of any new plan of manufacture that must be passed. Through all, the certainty of a priceless result has kept us striving.

To-day, with all the success we have gained, we do not claim to have perfected the work, but rather stand ready to give a hearty welcome to the new mind that shall penetrate still further into this field. I have a great feeling of satisfaction and of being fully rewarded for all the trouble and labour I have had, in the pleasure I have of managing so simple an operation in gas produc-

tion, and in to-day's comfort I really wonder if all the troubles of which I have spoken ever arose before me.

The gains from the use of naphtha or oil gas are direct and indirect—direct, as it touches the labour, coal, and lime; indirect, as it touches the question of repairs, maintenance, and construction, preventing the need of large retort-houses, coal stores, or large storeage capacity.

The labour is reduced nearly one-half, coal more than half, and proportionately larger yields of gas from coal used; as oil gases do not require lime purification, a consequent reduction in use of lime ensues.

The interest saved on money now invested in large supplies of coal, and the absolute saving in weather-waste of coal, are of themselves no inconsiderable items of gain. The present annual renewal of retort-benches dwindles into small proportions before the use of oil. Enough residuals—as coke and tar—are made to sustain the working benches, and yet give a balance for sale. In the construction of new plants large savings can be made, as extensive buildings are unnecessary.

But enough. There cannot be a doubt of the economy or value of oil gas as an auxiliary to coal gas. Our present knowledge of its manufacture does not justify us in using it alone to any extensive degree. The present vital need in the manufacture and use of oil gas is a cheap method of producing free hydrogen as a diluent, or the ability so to reduce the gravity of coal gas that it may sustain that relation more perfectly than at present; for while the water gases now in use aid in the more perfect combustion of oil gas, they detract nothing from its specific gravity, as they bear in them too great a per centage of carbonic oxide.

I have, in conclusion, purposely withheld from urging upon you any comparative results of the two methods of manufacture, or of entering into seemingly learned disquisitions upon the nature of the gas produced from naphtha, as its chemical and physical attributes are subjects of common knowledge among you.

I could not anticipate that within the limits of such a paper, or of your patience on this occasion, such details could be enumerated as would immediately convince you, or entirely remove your honest doubts.

It will suffice if I have awakened within you a desire to make personal investigations in this direction, in which I frankly admit that I believe the next great changes in our system of manufacture will occur.

Mr. Lewis (Detroit) moved that a committee of three be appointed to report to this convention to-morrow, on the value of naphtha gas compared with coal.

The motion was carried, and the president appointed Messrs. Neal, Cartwright, and Dwight.

(*To be continued.*)

THE STOREAGE OF WATER.

At the Meeting of the Social Science Association at their Rooms, Adam Street, Adelphi, on Monday evening, Dec. 14—Capt. Douglas Galton, C.B., F.R.S., in the chair—the following paper was read on

THE STOREAGE OF WATER.

By J. Bailey Denton, C.E., F.G.S.

The United Kingdom of Great Britain and Ireland is so different in the physical and meteorological conditions of its component portions, that in dealing with the question of water supply it is better to separate England and Wales from Scotland and Ireland. To England and Wales in combination, therefore, it is proposed to devote the following remarks on the advantages of the storeage of surplus waters, with the prefatory observation that whereas Scotland and Ireland in no way affect England and Wales with respect to this question, the two latter countries are so connected in the watersheds of some of our principal rivers, that it is impossible to separate the one from the other. To appreciate this it should be observed that, although broken by river-courses and valleys, the *back* of the country—called the Alpine range of the primary and early secondary geological formations—commencing with the Devonian hills of the extreme south-west of England, runs directly through Wales with its Silurian heights, to resume its course with the carboniferous series of the North of England. From the heights of these older formations nearly all the rivers of the west and the north take their rise, while the principal rivers of the midland and eastern counties have their sources in the outcrops of the oolites and the chalk.

The mean annual quantity of rain falling upon the face of the country west of the Lias outcrop, including the high grounds to which reference has just been made, varies from the extreme of 30 inches in the lower grounds to 80 inches in the Lake districts—leaving out exceptional extremes—the average of the whole being 38 inches, as near as accepted records allow of calculation. This division of the country contains rather less than 21 million acres. The mean of the midland and eastern districts east of the Lias outcrop varies from 20 to 36 inches, the average of the whole being 26 inches. This division of the country contains upwards of 16 million acres. The mean annual average depth of rain falling upon the whole of England and Wales is, according to Mr. Symons, 32 inches, exclusive of dew, which, when considering the question of water supply, may be taken to be equal to 4 inches. These 36 inches, therefore, together represent the average depth of rain and dew falling upon the whole country.

Before alluding to the manner in which this depth of water is appropriated or rejected by nature, it will serve to convey a distinct idea of what we really have the power of saving in the shape of water falling at our feet, if it be observed that the depth being 36 inches, there falls upon every square yard of surface a cubic yard of water, and that this cubic yard of water contains 168¾ gallons. It is, however, better to exclude *dew* from any calculation of quantity at command, and consider only the quantity of water obtainable from rain alone, which may be taken at 150 gallons per square yard of surface, if means be adopted to intercept the water before it is absorbed by or runs off the surface, and before it becomes contaminated by mixture with other substances.

The estimated quantity of liquid of all kinds drunk by men in active life has been given on the authority of Government (see "Report on Army and Navy Diet Scales") as 1500 lbs. per annum, or 187½ gallons. If this be correct, we may fairly assume that the average quantity of liquid drunk by men, women, and children is not more than two-thirds of this amount, or 125 gallons; so that, taking one part of the country with another, there falls in the shape of rain upon each square yard more than sufficient to satisfy one person with "drinking" water. To show the plenitude of water at command even more forcibly to the mind than perhaps these figures may do, at a time when the country is just recovering from a drought in which the scarcity of drinking water has been severely felt by a very large number of people, it may be further remarked that the rain falling upon 4320 acres of surface only is more than sufficient to supply the whole of the present population of 25 millions with drinking water. England and Wales contain 37,324,883 acres of surface, and it follows, therefore, that the rain falling upon one acre out of every 8640 acres is sufficient for the purpose. But the liquid actually drunk, including wine, spirits, beer, tea, coffee, water, and every other drink, does not reach a fiftieth part of the average quantity of water consumed and used by the people in one way and another for household, trade, and public purposes. If we measure our requirements by the use of water increasing gradually as one year succeeds another, we must admit that we shall not long be satisfied with a less average supply than 25 gallons a head, and if, again, we count our future population by the rapid increase which has taken place up to the present time—the census showing that the population has doubled itself in fifty years—we may reach at the end of the next fifty years a total requirement of 1250 million gallons of water daily, or 456,250 million per annum. Comparing these figures, representing the maximum quantity of water that should be provided, with the actual quantity of rain falling on the surface of England and Wales, amounting to 27,019,632 million gallons (37,324,883 acres × 22,622 × 32 = 27,019,732,103,232) we find that the former is 1-60th part of the latter. But these illustrations serve only to represent the quantity of water that, falling in the shape of rain, we have it in our power to collect as circumstances permit.

To arrive at a more practical view of the matter, and the one which is alone admissible in a national light, we must have reference only to the quantity of water which is servicable to the population without derangement of the *régime* of our rivers. It is therefore necessary to have reference only to the quantity of water which, at times of excessive rainfall, runs off the surface of the ground into our rivers, and by our rivers to the sea, as flood and freshet waters, without apparently performing any useful purposes on their way. On the western side of England and in Wales the amount of this surplus water varies in a most remarkable degree, but the available quantity cannot be less on an average than 20 inches, if we include the highest surfaces of the older formations already referred to, and which are our best gathering-grounds. In the midland and eastern counties the mean depth of water run off in the shape of floods and freshets has been represented as 6 inches, but, to be safe, we may consider that 5 inches represents the available quantity. In any case the minimum available quantity at disposal, after absorption for subterranean supplies and springs, will give us at least thirty times the utmost quantity that can be wanted by the population, and required by stock comprising all domestic and farm animals within the next fifty years.

In the face of this fact it must be admitted that the existence of a scarcity of pure water—the first essential of healthy life—is a disgrace to a nation claiming for itself one of the foremost places in civilization and science, for while we allow to run to waste thirty times as much water as we may require in the next fifty years, the leading medical authorities declare that to the want of a sufficient quantity of water, and to the increased pollution of existing sources of supply, is due many of the ailments and no small proportion of the present mortality of the people.

A complete investigation into all the circumstances affecting the present sources and distribution of water, the localities that possess superabundance and those that suffer from scarcity, and the means by which a more perfect distribution may be effected, should, it is contended, be an object of inquiry by persons competent to take such a comprehensive and practical view as shall command the confidence of the people and the Legislature. Up to this moment the matter has only been thoroughly investigated by chemists, who, it must be admitted, have thoroughly exhausted their branch of the subject. To the advantage of an inquiry instituted by the Government with all the powers of a Royal Commission, the writer desires the attention of the Association at its present sitting, and it may be sufficient to gain that attention if it is simply stated that at the present moment certain communities exist which are receiving, by public or general supply, more than 50 gallons of water per head, while there are other communities which also possess the advantages of a public supply that receive less than 10 gallons a head. And there are numberless villages also—to which the interest of sanitarians is specially directed—where no public water supply exists, and where the inhabitants in times of drought have been so badly off that they have been obliged to use the same water twice for washing and other uses. Agricultural labourers living in these villages have, during the last year, paid as much as twopence per pail for their supply, and have not unfrequently been compelled to make one pail of water serve the purpose of a household of six or seven persons.

The remarkable difference of rainfall which has occurred in recent years, at different seasons and in different localities, affords suggestive data for an inquiry into the capability of not only making the excess of one season supply the deficiency of another, but of making, in certain instances, and under certain conditions, the excess of one part of the country make good the scarcity of another.

During the last few years the following rainfalls have been recorded in representative districts in England, excluding the Lake district and Cornwall from the western district:—

	1867–8.		1868–9.		1869–70.	
	Winter. — October to March inclusive.	Summer. — April to September inclusive.	Winter. — October to March inclusive.	Summer. — April to September inclusive.	Winter. — October to March inclusive.	Summer. — April to September inclusive.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
East . . .	10·80	8·33	16·17	12·76	12·81	8·01
South . . .	13·39	12·92	17·69	12·47	13·47	5·51
West . . .	18·50	13·61	26·58	16·47	17·09	10·47
North . . .	10·10	9·85	16·09	10·77	12·72	7·46
Mean of winter.	13·20	—	19·13	—	14·02	—
Ditto summer .	—	11·18	—	13·12	—	7·86
Year. . . .	24·38		32·25		21·88	
	1870–1.		1871–2.		1872–3.	
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
East . . .	13·92	14·41	10·45	16·61	15·79	10·68
South . . .	15·76	19·30	20·94	16·23	27·48	10·46
West . . .	17·42	19·40	19·31	24·32	22·04	16·95
North . . .	16·42	18·64	14·60	21·43	19·57	11·92
Mean of winter.	15·88	—	16·32	—	21·22	—
Ditto summer .	—	17 94	—	19·65	—	12·50
Year. . . .	33·82		35·97		33·72	

Average of the six years, 30·34 inches.

The principal duties of the proposed commission may be stated in the following order:—

1. To ascertain the extent and character of districts suffering from an absence of supply or an insufficent quantity of water required for domestic, trade, and agricultural use, having reference to the greater density of population in some districts as compared with others. This branch of the inquiry would necessarily extend from the large and populous parts of the country, where trade and manufacture are crippled in times of drought from insufficiency of water, to those small towns and rural districts where water has been difficult to get at any price. During the present year many of those important towns which have expended large sums of money to obtain public supplies have been allowed to suffer very considerably, though in a less degree than rural districts in which no public provision has been made. With the exception of the collateral inquiry of the Rivers Pollution Commission on the general question of water supply, suggested by Mr. Neate, of Oxford, the only inquiries that have been made up to this time have been devoted to special services, such as the supply of water to the metropolis, for which a Royal Commission was appointed in 1828, and presided over by Telford, and another more recently, in 1867, of which the present Duke of Richmond was chairman, and the numerous investigations of committees of both Houses of Parliament on application for private water bills.

These, however, have been all of a special and local character, and it is asserted that much of the difficulty now attending the question is due to these partial inquiries.

2. To investigate the capability of raising water from subterranean sources, where nature has stored it in the water-bearing strata, or of collecting rain-water on the surface before it is absorbed, or can be contaminated by mixture with putrescible matter. This branch of the inquiry would have reference not only to the present and future amount of populations, but to the extent of trade existing, or likely to exist. In considering this part of the subject, many considerations will present themselves of the highest importance. The chemist has declared that our rivers, when once contaminated with sewage or animal secretions, become unfit for domestic use, and the deep beds of water existing in the water-bearing strata, as the chalk and the new red sandstone, have been pointed out as the best sources of supply; but up to this time little or no attention has been given to an equally important object, *i.e.* the effect of any large draught—immediate and prospective—upon these subterranean supplies in the water economy of the country, although many of our principal rivers are maintained by springs which find a discharge at the higher outcrops of impervious strata, which form the impounding basins, or in the beds of the rivers themselves. This remark would especially apply to the metropolis, where, if the 200 million gallons of water, which may be daily required fifty years hence, were pumped up from the chalk beneath, the higher springs of the London basin feeding the tributaries of the Thames, and other rivers, would be gradually reduced, and ultimately vanish to leave rural towns, villages, houses, and mills dependent for water upon them without any supply at all. The storeage upon the surface of the surplus rain water which is now entirely lost and forms no part of the supply of our rivers—divisible into two characters, the turbid storm water and the clear water of freshets—the writer contends is a subject pre-eminently demanding the attention of the country, as it is free from those complications which would attend the disturbance of subterranean supplies or the interference with the *régime* of our rivers.

Much, very much, may be done by the combination of districts. The difficulties attending districts where the population is dense, and where little water exists, may not unfrequently be overcome by union with other neighbouring districts in the same watershed in which population is scarce and water plentiful. In no part of the country has deficiency of water been more felt than in the suburbs of some of the principal towns in the manufacturing districts, while the towns themselves have possessed an ample supply. In special cases only can water from one watershed be conveyed to another without serious derangement, and in such cases regard should be paid to the future requirements of the districts naturally dependent on these sources of supply, not only in relation to the domestic wants of the population, but to the demands of trade too. It will be remembered that a few years ago (1867) it was proposed to take a large quantity of water from North Wales or from the Lake district for the supply of the metropolis, when the inhabitants of the north-western districts—considering very fairly that the time was not far distant when water would not only be required for the rapidly-increasing population of their own districts, but would be wanted to maintain those trades which are at present dependent upon coal for the creation of motive power—naturally objected to such wholesale abstraction. Recent experience has quite sanctioned this objection. There is no doubt that many of the manufacturing towns which would have been affected by it have since suffered very severely from recurring droughts. The years 1868, 1870, and 1874 were all years of scarcity, and tried the resources of Manchester and Salford to some extent, and that of Liverpool most severely. Bolton, Burnley, Blackburn, Wigan, Southport, Preston, Lancaster, and Oldham, with many other towns in those closely-packed districts of manufacture have realized the fact that they have no more water than they want, and may soon be obliged to add to their supplies. In the approaching session there will be many applications for water, some of which will be founded on the aggressive system of encroaching upon adjacent watersheds. It may be pertinent to remember that the original selection of Lancashire as the principal field of manufacture was doubtless due to the existence of water in abundance, and that it is deemed by many persons to be more than probable, now that coal, which took the place of water as a source of power, is becoming dearer and dearer every succeeding year, that it may be necessary to revert to the use of water in the place of coal. Careful investigations by disinterested competent persons can alone decide whether it is prudent, in a national point of view, to allow the water of one watershed to be taken from it for the benefit of another, as has been permitted by private Acts of Parliament, and most probably will be allowed again, on the ground that the demand is made for *immediate* social want, while the rejection of the proposal would be based on *prospective* requirements only. The very striking instance of the Thames and Severn Canal Company pumping up from the Thames watershed at Thames Head three millions of gallons daily and throwing it into that of the Severn, is a case in point. Three millions of gallons is equal to the quantity of water consumed by the towns of Oxford, Reading, and Abingdon. At the present time similar wrong-doing is being practised at Peterborough, where the Great Northern Railway Company raise a large quantity of water from the river Nene, which supplies a wide district of fen land below with fresh water, and, after using it for their locomotive engines, and for the supply of a town which they have built in connexion with their works, discharge the liquid refuse into the valley of the Welland, to the manifest injury of those persons having riparian interests in the Nene below Peterborough. It is quite certain that parliamentary committees, sitting on the private bills of water companies, are incompetent to decide such an important question as the effect of partial concessions on our national water economy.

3. The capability of storing water in the upper valleys of river systems to secure in some instances potable water not to be obtained from the river itself, and in others to maintain in our rivers a more equal flow of water by compensation in kind for water taken out of them. In very many instances it would be found that this capability exists, and that, moreover, water may be conserved for the profitable service of mills. Such an investigation would show that mills are not necessarily inimical to the proper drainage of the country, although in many cases they are found to be so under present conditions. This is probably an object of secondary importance compared with that of the supply of water to the people, but it is one that will form part of any inquiry devoted to a consideration of the subject in a wide and comprehensive manner.

4. The supply of water to villages and small towns where no public supply nor sufficient private supplies exist. This is, perhaps, the most pressing object to which inquiry should be devoted. To aid in the provision of water to small communities would appear to be, socially, a paramount duty of the State, inasmuch as small communities are less able to provide for themselves than large cities and towns, of which the inhabitants are comparatively wealthy, and the rateable value of property comparatively high. The character and position of small rural communities are such as to forbid their embarking in costly works, and oblige them to look to sources near at hand; and there are few instances in which they could not obtain the water they require at a moderate cost, if the *legal* difficulties of obtaining a supply from private estates near at hand were removed. The capability of storing rain water as it falls, and spring water as it rises, exists on most large estates. Some have the command of a constant outflow, summer and winter, which might be utilized for the supply of a neighbouring village without any loss to the owner of the estate, who, in a majority of cases, would willingly turn this special property to account for himself and his successors. If he be the owner in fee, he could, of his own free will, conserve and supply the water without additional legal facilities, using his own funds, or borrowing money for the purpose; or he might allow the future recipients of the water to carry out the necessary works on his estate at their own cost, making such agreement with them as may be mutually advantageous to both parties. If unwilling to adopt either of these courses, it would be a question for a commission to consider whether some facile means ought not to be granted which would enable a village to obtain water from such sources by compulsory action. If the owner of land from which water can be obtained is a tenant for life, or under legal disability limiting his interest in his estate, he would be naturally indisposed to lay out his own money, and turn water contractor for the supply of his neighbours; and, as the law now stands, he can charge his estate only with the cost of supplying water to those who are interested in his property as tenants, and who will themselves repay the outlay in a certain period of time. The existing Acts of Parliament for the improvement of landed property do not cover the construction of reservoirs, nor the laying of pipes for the supply of water to adjacent villages and neighbouring properties. They recognize only such improvements to landed property as carry with them such a return from the particular property improved as will more than cover the annual instalments by which the outlay will be repaid, with interest, in the number of years fixed by those Acts. For no other character of works can the reversionary interest be charged with the costs. Hence the supply of water to neighbouring villages not the property of the owner of the land upon which water may be conserved cannot now be legally carried into effect by any engagement binding on succeeding owners of entailed estates. It is considered that, if facilities were given to landowners to execute works such as are here pointed out, and to supply the neighbouring properties as well as their own, they would readily take advantage of them, and charge the cost upon the properties after having contracted with the recipients of the water to pay a full and fair amount. By doing this, not only would the present and succeeding owners of the property upon which the water-works would be constructed profit by the transaction, but the recipients of the water would certainly gain what they require, and what the State is bound to secure to them.

5. The mode of constructing reservoirs and tanks, and their cost; the ready purification of the water of small streams, when turbid, by its filtration through soil; and the use of water and wind in winter, when there is no deficiency of either, to lift the water to be stored for summer use. These are severally important objects for inquiry. Much experience has been gained throughout the country on these several heads, which, if collected, would be of great value to the public. The use of wind in connexion with the storeage of water is itself an object of considerable importance, though at present disregarded because of its fickle character. During the winter and spring, when surplus waters are abundant, wind is generally abundant also, and the application of this natural power to lift water from a lower to a higher level would be a matter of extreme simplicity where the quantity of water wanted is comparatively small, if examples were collected and published under the authority of competent persons, who would test their practicability. Very little, too, is generally known of the use made of concrete of all kinds in reservoirs and tanks. Economy in the small appliances required for rural villages has, in fact, been lost sight of in the magnitude of the services required for large cities and towns; and, in order to supply information available for villages, it is absolutely necessary to investigate what has already been done with various materials in different localities, subject to different atmospheric influences, and, if necessary, to test their uses by actual experiments. Underground tanks are stated to have been made, with and without arrangements for filtration, at costs varying from 30s. to 60s. per 1000 gallons. A tank capable of holding 2500 gallons—a quantity which may be collected from the roof of a cottage by conserving the rainfall to a depth of 6 inches, a depth less than half that which must be reckoned upon under any circumstances—may be made for £6 to £7, and this would afford a supply to a household of five persons, using 4 gallons each per diem, for more than a third of the year—*i.e.*, 125 days.

Inquiry into details such as these may appear too trifling for a Royal Commission, but when their influence in securing improved health to the working classes throughout the country is considered, and the fact acknowledged that the dread of heavy outlay and the want of legal facilities are the only causes why half the cottages in rural villages are at present without a wholesome supply of water, the very insignificance of the impediments will be recognized in themselves as one good reason for the inquiry.

It is believed that the collection and publication of information of the practical character here suggested, as a complement to the scientific researches of the Rivers Pollution Commissioners, would do more to strengthen the hands of the Local Government Board, and remove the hesitations and contradictions which now prevail among its officers, than any step that could otherwise be taken.

The CHAIRMAN moved that the paper be referred to the standing committee of the Health Department of the Association, with a view to their taking such action upon it as they might think desirable.

Dr. RYALLS seconded the motion, and referred to the contest which occurred last session between the Corporation of Wakefield and the Sheffield Water Company, in which Wakefield failed to obtain an additional supply of water, of which it stands sorely in need, and also to wells being polluted by mining operations, so that just as the population increased, its water supply was cut off.

Mr. BALDWIN LATHAM referred to residents on the Surrey hills, who stood greatly in need of water, of which there was an abundant supply beneath their feet, and who were at times driven to such straits that they ladled out of ponds water so thick that it was impossible to see anything through it, and which had to stand in buckets for hours before it could be used. Yet these people were perfectly helpless, because they occupied houses that were owned by large landowners, who did not think it expedient to carry out the necessary works. He had examined mining districts in Yorkshire in which the people were dependent upon shallow wells, into which water percolated from cesspools and drains; but he was happy to say that in some cases proprietors of mines had adopted measures which were proved by experience to be eminently successful to keep water out of their mines, and to store it in a pure condition for their workpeople.

In the course of the conversation that followed, it was urged that the utter chaos which prevailed throughout the country called for statesmanship and legislation to define the watersheds, to prevent the creation of new private rights to the prejudice of public claims, and to create authorities which should determine, on large and general grounds, the most beneficial appropriation of the sources of supply, and to stop the scramble, the expensive contests, and the partial inquiries that occupied so much time in parliamentary committees.

The paper was referred to the standing committee, with a view to some further action.

THE ALLEGED FRAUDS IN EUPION GAS SHARES.—At the sittings of the Central Criminal Court, Old Bailey, on the 14th inst., Mr. Besley made an application to the Recorder that in the case of the directors of the Eupion Gas Company, who are charged with endeavouring to defraud certain members of the Stock Exchange of a large sum of money by false representations, the witnesses might be excused from going before the grand jury, and that the prosecutors should not be required to prefer a bill before the grand jury at the present session. He said that this arrangement would be convenient to all parties, and the application was made with the consent of the defendants. Mr. Montagu Williams, on behalf of the defendants, said he had no objection to the course proposed to be taken by Mr. Besley. The Recorder therefore granted the application, and no bill will be preferred before the grand jury until the next sessions.

POLLUTION OF RIVERS.

REPORT OF THE COMMISSIONERS.

The Fifth Report of the Commissioners appointed in 1868 to inquire into the best means of preventing the pollution of rivers was issued last week, and their conclusions are summed up as follows:—

We are of opinion that any law having for its object the prevention of river pollution should—

1. Absolutely forbid under adequate penalties the casting of solid matters into the river channels;

2. Enact the foregoing standards of purity below which any liquid discharges into watercourses should, with the exceptions already mentioned, be forbidden;

3. Give power to all manufacturers in towns, except those of gas, paraffin oil, pyroligneous acid, animal charcoal, tin-plate and galvanised iron, to discharge their drainage waters into the town sewers under suitable regulations;

4. Confer additional powers on corporations, local boards, manufacturers, and mine owners to take land compulsorily, under "provisional order," for the purpose of storing their waste refuse, or of cleansing sewage or other foul liquids, either by irrigation, filtration, or otherwise.

We are further of opinion that the equal and efficient administration throughout the country of any Act that may be passed for these purposes would be best secured by the appointment of inspectors, to whom should be committed the duty of detecting and proving offences against the law, and of procuring the conviction of offenders. We are, moreover, strongly of opinion that in order to secure the independence of these inspectors from local influence, they should, like the inspectors under the Alkali Act, hold their appointments from your Majesty's Government.

On the formation of River Conservancy Boards with limited authority for local taxation, and power to authorize and direct expenditure for the purpose of river improvement—as, for example, in the purchase and removal of weirs, the straightening and deepening of watercourses, and the formation of upland reservoirs—we have already stated our opinion in our report (1870) on the Mersey and Ribble basins. There is undoubtedly a large field for useful work in every important river basin both in England and Scotland for a Conservancy Board of this kind; and it is certain that whenever the necessity of the various river improvements which it would direct and superintend shall have become urgent, a representative body of this kind will be indispensable, having power, in connexion with the local and corporate authorities within the river basin, to levy rates for defraying the cost of whatever operations it may direct. But we are convinced that the thing of immediate and imperative importance in connexion with river improvement throughout the country is simply the prohibition, under adequate penalties, of the gross pollution which at present renders so much of the running water of this country useless to manufacturers, agriculturists, and the public generally.

The conclusions which we thus humbly submit to your Majesty have been arrived at after an inspection of nearly every town and district in Great Britain where any manufacturing or mining operations of importance are carried on. We have, moreover, personally examined during the past five years 49 woollen factories, 14 works in which cotton is dyed, printed, or bleached, 16 chemical and alkali works, 10 linen, jute, and flax mills, five silk mills and dye works, 19 paper mills, four paraffin oil works, four alcohol distilleries, four starch works, four tanneries, one sugar factory, two soap works, one salt work, five cutlery works, one nickel foundry, four silver, German silver, and electrotype works, five brass foundries, eight wire, tin-plate, and galvanizing works, three iron works, 69 mines, besides 43 works for the purification of sewage; and the standards of purity below which we recommend that all liquid discharges into river channels be forbidden have been adopted after an investigation which has involved no fewer than 1200 analyses of the various drainage waters which offend them, before and after the various modes of treatment which we have investigated, in addition to more than 2000 samples of river and other waters before and after pollution.

The Commissioners also recommend that the following liquids be deemed polluting and inadmissible into any stream:—(*a*) Any liquid which has not been subjected to perfect rest in subsidence ponds of sufficient size for a period of at least six hours, or which, having been so subjected to subsidence, contains in suspension more than one part by weight of dry organic matter in 100,000 parts by weight of the liquid, or which, not having been subjected to subsidence, contains in suspension more than three parts by weight of dry mineral matter or one part by weight of dry organic matter in 100,000 parts by weight of the liquid. (*b*) Any liquid containing in solution more than two parts by weight of organic carbon or 0·3 part by weight of organic nitrogen in 100,000 parts by weight. (*c*) Any liquid which shall exhibit by daylight a distinct colour when a stratum of it one inch deep is placed in a white porcelain or earthenware vessel. (*d*) Any liquid which contains in solution, in 100,000 parts by weight, more than two parts by weight of any metal, except calcium, magnesium, potassium, and sodium. (*e*) Any liquid which in 100,000 parts by weight contains, whether in solution or suspension in chemical combination or otherwise, more than 0·05 part by weight of metallic arsenic. (*f*) Any liquid which, after acidification with sulphuric acid, contains in 100,000 parts by weight more than one part by weight of free chlorine. (*g*) Any liquid which contains in 100,000 parts by weight more than one part by weight of sulphur, in the condition either of sulphuretted hydrogen or of a soluble sulphuret. (*h*) Any liquid possessing an acidity greater than that which is produced by adding two parts by weight of real muriatic acid to 1000 parts by weight of distilled water. (*i*) Any liquid possessing an alkalinity greater than that produced by adding one part by weight of dry caustic soda to 1000 parts by weight of distilled water. (*k*) Any liquid exhibiting a film of petroleum or hydrocarbon oil upon its surface, or containing in suspension in 100,000 parts more than 0·05 part of such oil.

In any enactment for the correction of river pollution the above standards may be safely qualified by the following proviso:—Provided always that no effluent water shall be deemed polluting if it be not more contaminated with any of the above-named polluting ingredients than the stream or river into which it is discharged.

We have, however, to point out a special difficulty existing in the case of some of the short mining rivers of this country which may make it necessary still further to extend that reasonable degree of consideration for the difficult circumstances in which offenders against river purity find themselves.

There are streams in Cornwall, of which the Red River below Camborne may be taken as a type, whose course has been, and is being, so laden with valuable mining refuse that successive locks for the recovery of that refuse have, at great cost, been established at frequent intervals along the whole course of the river channel. It is plain that the case of a stream thus circumstanced, where the landowners royalty, the labourers earnings, and the interests of the capitalist—the interests, in short, of the whole resident population—are dependent on the maintenance of the river channel in its present character as an apparatus for the recovery of mining produce, it would be the utmost pedantry to insist upon such remedies for river pollution being adopted at the great mines above as would destroy the whole of the vast industry below them, on whose prosperity all classes are dependent. It appears to us, therefore, that there are connected with the mining industry some streams which may very properly be altogether excepted from the application of those special enactments on which we depend for river restoration elsewhere. Such exceptions may be the more readily conceded when it is remembered that rivers polluted by mines emit no offensive exhalations such as those which arise from streams fouled by chemical works and by town sewage refuse, from dye-works, and other putrescible organic matters, which poison the air or inflict discomfort even at considerable distances from the water.

Even in these exceptional cases, however, it is plain that any person who is injured or aggrieved by the condition of the stream must be allowed his remedy.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The local iron trade grows duller and duller, if the tautology may be deemed excusable, week by week. My reports in these columns have for a long time past given what I may confidently term a faithful reflex of the current state of trade, and have often been of a very different character to those presented by the local and district newspapers. These, however, have suddenly become aware that trade is in a far quieter condition than they have represented it to be from time to time, and have, consequently, given a series of detailed reports relating to several industries during the past week.

In the file trade, for example, matters are at a low ebb. Many even of the principal houses find it difficult to give employment to their workmen, and in more than one case a large number of men have been altogether discharged. This industry, like several others at Sheffield, is to a great extent dependent on the American market, which is at present in a depressed and altogether disorganized condition.

Then, again, the engineering trades are very quiet, and at some establishments dismissals of men are the order of the day. In the foundries there is much less work than a few months back, but I have not, up to the present time of writing, heard of any notable instance either of workmen being thrown out of employment, or of reductions of wages. Either course is, however, extremely probable, and will very likely be resorted to before long. Pig iron is still weak in price, and likely to become yet more so, as the depression in the finished iron and foundry branches becomes more marked. Cleveland agents hold their general brands at about the following prices:—No. 1 foundry, 69s.; No. 2 foundry, 66s. 6d.; No. 3 foundry, 64s.; No. 4 foundry, 60s. 6d.; No. 4 forge grey, 58s.; No. 5 forge mottled, 57s.; No. 6 forge white, 55s.; refined metal, 79s.; Kentledge, 65s; and cinder pig, 47s. 6d. per ton at the works or in railway waggons.

There is a certain want of animation in some branches of the local coal trade, but not, of course, in the house coal department, which is rendered very brisk by the continuance of wintry weather. The steam coalowners of South Yorkshire have held several meetings of late on the subject of prices, and at the last one passed a resolution reducing the list quotation 1s. per ton. Steam coal, which has, therefore, been sold at 13s. or thereabouts per ton, is now offered at 12s., or a fraction over. There is moderately large business doing in gas coal, which is quoted at about 12s. 6d. to 13s. per ton on the average. The block on the Manchester, Sheffield, and Lincolnshire Railway, which has caused an enormous amount of inconvenience and great loss to the local coalowners, is now to a considerable extent a thing of the past.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

Dulness still prevails in the iron markets of South Staffordshire. Orders are day by day growing more scarce, and there seems no prospect of any permanent improvement in the demand for finished iron until prices have been adjusted to meet the requirements of the market. Meanwhile, the makers of branded iron are firm in their adherence to late rates, and will not hear of a reduction; and the makers of second qualities can ill afford to make any further concession in prices until wages have been again revised, and easier rates for fuel are obtained. Common bars have changed hands at £9 5s. per ton, but this must be rather with the view of keeping the mills running than of doing a remunerative business. Ordinary sheets (singles) are quoted £12 5s., and the qualities used for galvanized roofing purposes are in moderate inquiry. Nail-rods, plates, and angles are also in fair request.

Nails are now in exceptionally good demand, owing to the scarcity of operatives, the proverbially low scale of wages paid for some years past to the "nailers" in the Sedgley district has driven numbers of them to seek employment in other branches of local industry.

Pig iron is still firm, and in demand at from £3 5s. for common to £5 10s. for best qualities. Messrs. John Bradley and Co. (Mr. W. O. Foster) have decided to relight a furnace at Shut End, near Kidderminster, which will raise the number blowing in the district to 81, against 94 for the corresponding period of last year. The coal trade is firmer, the sudden fall of snow having caused operations to be suspended at most of the collieries, and for thick coal there is just now a good demand. It is generally expected that a reduction of 2s. per ton on thick coal will be declared early in January, but the coalmasters do not encourage the belief. Common qualities of manufacturing fuel are still rather slow of sale, and engine slack is abundant; good forge coal may be had at 9s. per ton, and fine slack at 4s. per ton. From returns just published, it appears that the quantity of coal raised in South Staffordshire during the year 1873 was 11,100,000 tons, being an increase of 550,000 tons on the previous year. Coke is in improved demand at late rates.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

A good demand is maintained for all classes of coal, and in the better descriptions prices have rather a stiffer tendency, but there has been no alteration in list rates. For engine coal there has been a fair demand, but the stiffness in the market does not arise from any absolute scarcity of coal, but rather is due to the delay in the transit; and, if it could only be properly delivered by the railway companies, it would, in all probability, soon become somewhat of a drug upon the market.

The gas coal trade is very brisk, as most of the gas-works are in urgent need of coal, in consequence of the stocks which were worked down during the strike not having been replaced, and there does not seem much probability of their being able to secure any very large supplies at present, in consequence of the difficulty of getting the coal conveyed from the collieries by the railway companies. In some cases stocks are now so low from this cause that serious apprehensions are entertained as to whether many of the works will be able to continue their production of gas without interruption. Very few quotations are now offering in the market, as colliery proprietors generally, from the cause mentioned above, are not in a position to meet the requirements of their customers who are under contract. Prices, however, are very stiff, and where quotations are given they are very often simply of a prohibitive character.

I may state that the inability of the railway companies to meet the demands at present made upon them for the transit of coal over their lines in this district is a matter of general complaint. Loaded waggons have, at many of the pits, been standing in the sidings for days, whilst customers, I might say, have been almost starving for coal; and, in other cases, colliery proprietors have been compelled to put large quantities of coal down upon the pit banks, simply because there was no possibility of getting it conveyed to a market where it would meet with a ready sale. This inconvenience is now being so severely felt that meetings on the subject are talked about.

Although the miners in the Wigan district have been unable to obtain any alteration in the present rate of wages, the colliers in the Tyldesley district have been more successful, the masters having been compelled, conditionally, to

grant them a return of the 10 per cent. which was taken off their wages a few weeks ago.

In the Wigan district, the miners who have seceded from the Amalgamated Association, which was practically started in this neighbourhood about five years ago, are talking about establishing an independent association of their own.

Business in the iron trade during the past week has been very dull, and prices continue to exhibit a weakening disposition, especially in foundry descriptions of pig iron, Middlesborough makes of which are now quoted as low as 70s. 6d. for No. 3, and 69s. 6d. for No. 4, net cash, for prompt delivery in the Manchester district, and forge iron, delivered, can be bought at about 65s. 3d. per ton. For forward delivery, foundry iron is quoted 1s. to 2s. less, and forge about 6d. per ton less. Notwithstanding, however, these low quotations comparatively little business has yet been done for next year. There is very little doing in manufactured iron, but there is no change at present in prices, ordinary bars delivered being quoted at from £7 5s. to £7 7s. 6d. per ton, but there are rumours, which, however, can only be taken for what they are worth, that one of the Staffordshire makers is selling, for next quarter's delivery, at £2 per ton under present prices, subject to the quarterly meeting.

There is no material change to notice in the position of the various iron-works in this district, which continue fairly employed in prompt specifications, but do not seem to be securing much work for next year.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The stormy weather still interferes with trade, and except steamers very few coal-laden vessels sailed from the Tyne or adjacent coal ports last week. The same difficulty which was complained of last week continues to exist to the same considerable extent. Though the collieries are able to work enough gas coals to meet the requirements of trade, the North-Eastern Railway Company have not yet been able to send enough trucks to the pits to bring away all the coals required, which have also been unwrought. The consequence has been that several small sailing vessels, which were taken up some time ago not having been loaded, their lying days having expired, have been placed in demurrage. Best gas coals fully maintain recent quotations. The price of household coals is steady, quotations being from 15s. to 16s. per ton, but notwithstanding the recent coarse weather the demand though pretty steady has not been excessive. The steam coals have improved a little in the demand, especially for the very best kinds. Large discounts had to be given for the second qualities before any business could be done worth mentioning. Manufacturing and small coals are without demand, and that term may be stereotyped for this class of coals until the turn of the year, as there is no prospect of change. Small sailing vessels still continue scarce. There appears to be an abundance of orders for coals for the bye ports, if the vessels to carry them could be had. Masters seem to have been frightened with the recent storms, and they are somewhat reluctant to bring their vessels out of the creeks and roadsteads, where they sought shelter, until the weather is thoroughly settled. There is little or no foreign business doing, and there is scarcely a Mediterranean or Baltic freight in the market.

The finished iron trade of the Cleveland district is in very poor condition. The falling off in demand is chiefly in rails. There is scarcely any trade doing with America just now. A good few rolling-mills continue to be laid off. The production of pig iron is well maintained. There has been less doing in plates and sheets since the termination of the navigation season. The chemical trade is dull, and there is little inquiry at present for fire-clay goods, especially for exportation. The tendency of trade in this district is evidently to lower wages amongst workmen, for not only have the Northumberland miners got notice of a fall of 10 per cent., but in the iron shipbuilding and some other trades a similar reduction may be anticipated.

A good deal of discussion is going on in the Town Councils on the Tyne with regard to a better supply of water to the district, but except the formation of the East Northumberland Water Company nothing very definite has been done. The names of several wealthy coalowners are found amongst the proprietors of the East Northumberland Water Company, and it looks like a substantial undertaking.

THE METROPOLITAN BOARD OF WORKS AND THE CONSTANT WATER SUPPLY.—At the last meeting of the board, the following recommendation of the General Purposes Committee was adopted—"That the Kent Water-Works Company be informed, in reply to the notice of their intention to give a constant supply of water in Woolwich and Charlton, that *the board have no objections to offer to the proposal.*"

REDUCTIONS IN THE PRICE OF GAS.—The Heanor and Langley Mill Gas Company have made a reduction of 3d. per 1000 feet. The Cirencester Gas Company announce that the price of gas will be reduced to 5s. per 1000 feet on the 1st of January next, with the usual discount of 5 per cent. for prompt payment. The Old Swindon Gas Company intend to reduce their price to 5s. 10d. per 1000 feet with the new year. At Alfreton also there will be a reduction of 5d.

SALE OF THE TUILERIES GARDEN GASLIGHTS.—The *Builder* says: "The whole of the lamp-posts, with their burners, glass globes, brackets, &c., in short, all that served for lighting the Tuileries Gardens with gas, have been sold by public auction in one lot. The first bid was 8000fr., and the biddings rose to 9010f., or £360, at which the lot was knocked down to M. Lacarrière, the constructor of the chandelier in the New Opera House, who has to clear all away in ten days. There are 9009 large glass globes and 8100 smaller glass globes among the articles comprised in the lot."

WATER WORKS IN AMERICA.—New water-works have recently been completed at Hudson, New York. The water is pumped from the Hudson River, forced to a reservoir at an elevation of over 300 feet, and thence distributed throughout the town. It is stated that the height of the reservoir makes fire-engines entirely unnecessary. On a trial of the works on the 20th of November, eleven streams were thrown simultaneously, at various parts of the town, to heights averaging 175 feet, and at a given signal seven hydrant streams were concentrated, and reached to a height of 120 feet.

OPPOSITION TO THE BIRMINGHAM GAS AND WATER BILLS.—A special meeting of the West Bromwich Commissioners was held on Wednesday last, to determine whether they should oppose the Birmingham Gas Bill, the South Staffordshire Water-Works Bill, and the various other bills proposed to be promoted in Parliament in the ensuing session. Mr. Farley presided. It was decided to oppose the bills, and a committee, consisting of the chairman, Mr. P. D. Bennett, and Mr. E. Caddick, was appointed, with power to take such steps as they might deem necessary to carry out the opposition, and to confer with the Birmingham Corporation and the authorities of the adjacent towns on the subject.

INJURY TO A GASHOLDER AT STOURBRIDGE.—A very singular accident is reported as resulting from the heavy fall of snow last week. On Wednesday a large gasholder at the works of the Stourbridge Gas Company was observed to be tilted towards one side, being apparently thrown out of balance by the weight of snow accumulated upon it. On examination a fracture 4 feet in length was discovered, and the whole of the 55,000 feet of gas in the holder escaped. Stourbridge the following night was only partially supplied with gas, a state of things that will probably continue for several days. The gasholder settled down in its bed without much damage, but some of the iron guide-rods were twisted by the holder being out of place.

SUFFOCATED BY SEWER GAS AT WIDNES.—An inquest was held at Widnes on the 16th inst., to inquire into the circumstances attending the death of a man named Duffy, who died on the previous Sunday. The evidence showed that Duffy and a mate named Seed were excavating in Church Street, Widnes, on the 11th, when the gas and obnoxious smells emanating from the sewer—which was but of recent construction—were so strong as to overpower them, and one fell in. Seed recovered in a few hours; but Duffy, as stated above, died on Sunday. The street in which the accident happened has been in a disagreeable condition for a length of time, and the jury, in returning a verdict of "Accidental death," censured the persons responsible for allowing the street to remain in such a state. The deceased leaves a wife and eight children.

OUR COAL-FIELDS.—The coal raised from the mines of the United Kingdom in 1873 amounting to 128,680,131 tons in all, and constituting the largest quantity ever produced in a year, came from the following districts:—62,102,866 tons, approaching half the entire quantity, was raised in the North of England—viz., in the Yorkshire district, Lancashire, and the four English counties north of these; 28,890,875 tons, or between a fifth and a fourth of the whole, came from midland counties—Stafford, Derby, Nottingham, Worcester, Salop, Chester, Leicester, Warwick; 13,943,623 tons, nearly a ninth of the whole, from Wales, South Wales supplying not far from five-sixths of the Welsh coal; 6,749,264 tons, not quite a nineteenth of the whole, came from the south-western district—Somerset, Devon, Gloucester, Monmouth; 16,857,772 tons, considerably over an eighth of the whole, from Scotland; 135,731 tons from Ireland.

EXPLOSION OF GAS AT SUNDERLAND.—A somewhat serious explosion of gas occurred on the 12th inst., in a public-house, at the corner of Bridge Street and West Wear Street. The workmen of the Sunderland Gas Company were engaged laying new piping in connexion with the bar, and, in consequence of the communication with the main being disturbed for the purposes of their work, the gas had escaped and filled the cellar. Shortly before noon the men were working in it, when a labourer unfortunately struck a match, the result being an explosion of an extensive nature. The person in charge of the bar over the cellar was injured, and some half dozen persons who were on the premises at the time were thrown down. It is stated that no less than 300 bottles of liquor were broken, besides a very large quantity of glasses. The building itself sustained considerable damage, one of the windows of the bar being blown out, while both the roof and the floor were raised several inches.

THE SEWAGE QUESTION AT BARNSLEY.—On Thursday last an extraordinary meeting of the Barnsley Town Council was held for the purpose of considering the schemes brought forward by Mr. Hawksley and Mr. Bailey Denton, for disposing of the sewage of the town, an injunction having been obtained to restrain the authorities from sending it into the Dearne. The chair was occupied by the mayor, who introduced the subject, pointing out the difference between the two reports of the gentlemen named, Mr. Hawksley's being in favour of the precipitation mode, and Mr. Denton's of the system known as the downward filtration with irrigation. After considerable discussion Mr. Brady moved a resolution to the effect that, taking exception to the proposal to take 100 acres of land, as included in the report of Mr. Bailey Denton, the scheme of that gentleman be adopted. Mr. Piggott seconded the resolution, agreeing with Mr. Brady that it was not desirable to carry out that part of Mr. Denton's report with regard to broad irrigation, and that it should be altered with regard to the estimates for the change proposed. Alderman Tyas moved a resolution to the effect that notice be given for the taking of 100 acres of land for the carrying out of Mr. Denton's plan, with the view of treating for such quantity as might be required. After some discussion, Messrs. Brady and Pigott accepted the resolution of Alderman Tyas, which was then agreed to.

STOVE COMPETITION.—We published in this JOURNAL, Dec. 17, 1872 (p. 1044), a list of prizes offered by the Society of Arts for new and improved arrangements in promoting economy in the use of fuel for domestic purposes. The prizes were five in number, each consisting of a sum of £50 and the Society's gold medal. The two first were for grates consuming coal in heating and cooking, combined with warming and ventilating the room; the third and fourth were for apparatus effecting the same objects by the use of gas; and the fifth for any new and improved system or arrangement, not included in the foregoing, which would efficiently and economically meet domestic requirements. The committee of the Society of Arts have just issued an announcement, from which it appears, that there were 204 articles sent in for competition, and after careful consideration and some correspondence with the exhibitors, 107 were retained for the purpose of being tested. The duty of personally conducting the experimental testing, under the superintendence of the committee, was placed in the hands of Mr. Davies, and the operation of testing extended over many months. A careful consideration of the returns and facts in the hands of the committee, and their report, has forced upon the council the conclusion, which they have arrived at with very considerable regret, that while giving full credit to the invention and efforts of the competitors for the care and labour which they have bestowed upon their contrivances, the council nevertheless are unable to award any prize.

LEEDS WELL WATER.—On Thursday last a number of persons were summoned, at the Leeds Police Court, for using water from wells said to have become polluted so as to be injurious to health. Among these, four persons were summoned for the use of a well at Moortown. The analyst's report on this well stated that the substances found in the water were indicative of sewage contamination. He found ammonia and nitrogenous organic matter in proportions largely in excess of those contained in wholesome drinking water. The persons summoned stated that they had applied for the town's water, and were willing that this well should be closed up. An order was therefore made that it should be closed at the end of two months from this time.—The next case was that of a public well at Chapel-Allerton, which was reported on in similar terms to the others. It was stated that three years ago there was a severe outbreak of fever here, the cause of which was traced to the use of the water in this well. It was found that the sewage from several houses percolated into the well. A notice of this application to have it closed was posted on the pump, but no one appeared against it. The magistrate said he was afraid if he made the order some of the people would come down stating that they had always used this water for washing purposes, and he thought some other step should be taken before having it closed up. The town-clerk said the town's water was laid on there, and could always be obtained. The magistrate remarked that this water could be obtained for nothing for washing purposes. The Town-Clerk: It is better for them to pay for the town's water than use water that would bring on disease. The Magistrate: I must have further time for consideration. I don't think that I ought to make this order unless there has been some more public notice. Here is a well which has been used for a great many years; you are asking to shut it up, and I think it would be very advisable that some public notice should be given of this. The town-clerk said that notice had been given; but, on the suggestion of the magistrate, he consented to the adjournment of the summons until the 8th prox., notice to be given in the Leeds papers by advertisement in the interval.

WATER-WORKS.—In most of our larger towns the demand for water (40 or 50 gallons daily per head of the population) is by far too extensive to be supplied by springs or wells, and then the engineer must have recourse to lakes, streams, or reservoirs, situated in high gathering-grounds, and often at considerable distances. Pumping and filtering from some adjacent river is occasionally resorted to, but this method is expensive, and the water is usually inferior (though soft), all our rivers getting more and more contaminated by the industrial processes of the country, and the increasing cultivation and manur-

ing of the lands through which they flow. The great effort of modern engineering is to secure some hilly, pastoral region, where there is an abundant rainfall, little or no cultivation, one or more natural lakes, or in the absence of these, some depressions and glens where the streams can be impounded by embankments, and a series of reservoirs established. This is now the ordinary mode of supply, most of our large towns—Glasgow, Edinburgh, Dundee, Newcastle, Leeds, Sheffield, Manchester, Liverpool, &c.—receiving their water in this manner from distant high grounds, and through an expensive system of reservoirs, compensation ponds, tunnellings, aqueducts, pipings, and filterings. Such water-works require the highest skill on the part of the engineer—a knowledge of the nature, extent, and rainfall of the gathering-grounds, the quality of the water as affected by the formations of the district, the choice of sites for reservoirs, the strength of embankments, the character of the rocks to be tunnelled through, and generally a great deal of information, involving more or less some acquaintance with geology. There are wide differences between a gathering-ground of granite, one of schistose rocks, another of limestone, a fourth of sandstones, ironstones and shales, and a fifth embracing tracts of peaty and boggy moorland. It may be necessary to lead in some springs and to exclude others; the rocks of one glen may be retentive, and eminently suited for a reservoir, while those of another might be so porous as to cause perpetual leakage; the rocks and springs of one tunnelled aqueduct might be innocuous to the supply, while those of another might contaminate it with saline and metallic impurities. These and many similar circumstances will all come under the consideration and discrimination of the water engineer, and it is just owing to the range of his knowledge and his aptitude to decide why the works of one man turn out a success and those of another a failure, and a perpetual source of expense and dissatisfaction.—*From Page's "Geology in its Relations to the Arts and Manufactures."*

Society of Engineers.—The annual dinner of this institution was given at the Cannon Street Hotel on Wednesday evening last—Mr. V. Pendred in the chair. After the usual loyal toasts, the chairman, in proposing "The Army, Navy, and Volunteers," remarked that there never was a time when people did not grumble about our army, saying that the soldiers were bad and the officers were bad. But, for all that, the great fault found with them was that there was not enough of them. At Cressy, Agincourt, and Waterloo our army was small, but, small as it was, it had been found enough. There was a special reason why the Society of Engineers should drink the toast of "The Navy" with enthusiasm, because now from the lowest rivet in the keel of an ironclad to the highest rivet in her funnel the whole was the work of the engineer. The fault we had to find with our navy was much the same as that which we found with our army—we had not enough of ships. History showed that in most of our naval engagements we were many ships too short—sometimes 10, sometimes 20; but for all that we had almost invariably proved a match for our foes. Englishmen had been ever ready to volunteer when there was fighting to be done, and if there were not many volunteers now coming forward, the reason was because they could get no fighting. He believed that both the army and navy were equal, and more than equal, as they had ever proved themselves, to meet whatever foe might present himself. With reference to the volunteers, his belief was that, if an enemy had to be actually encountered, the volunteer force would soon be trebled. Captain Varley returned thanks for the army, Mr. Murdoch for the navy, and Major Baldwin Latham for the volunteers. The chairman then proposed the toast of the evening—"Success to the Society of Engineers." The advance of the society had been gradual, but he hoped to see a large increase of their numbers. Engineering might be said to be a thing of yesterday, and it had not acquired for its representatives a status like that which might be secured in other callings requiring knowledge and experience. He hoped that not only would this society increase in numbers, but that the character of their members would be worthy of their profession. It was perhaps an unfortunate fact that engineers could not take out a diploma as doctors did. It was quite true that a gentleman might enter certain colleges and obtain something which was tantamount to a diploma, but many persons competent to act as engineers were not able to secure such means for instruction. In a society such as theirs they should not only have plenty of members, but care should be taken that such members were duly qualified. The success of their society should be such as that the mere fact of a person being able to write after his name "Member of the Society of Engineers," would be a public guarantee that he was really competent to perform the work of an engineer. Mr. Alfred Williams, the treasurer of the society, in returning thanks, spoke in terms of congratulation as to the progress it had made since his first connexion with it. The number of members was satisfactory, and their "transactions" were interesting and valuable. Much as he valued his connexion with it, he did not attach much importance to his right as a member to attach M.S.E. to his name, and he did not think the world was much impressed with such distinctions, when they found in the present day persons advertising themselves as M.B.W. (Member of the Board of Works). It would be better that men should seek to attain that proficiency in their profession or calling which would justify the public in reposing confidence in them. The health of Mr. M'George, the president, who from ill-health was not able to be present, and that of the chairman were proposed by Mr. Spice. The chairman acknowledged the compliment, and proposed the health of Mr. J. H. Adams, president-elect for the coming year. Mr. Adams returned thanks. Several other toasts were given, and some well-selected songs were sung during the evening.

Doncaster Water-Works.—The laying of the foundation-stone of the embankment of the reservoir at Hooton Brook, in connexion with the new and extensive water-works about to be constructed for the supply of Doncaster, took place on Wednesday afternoon last. The ceremony was performed by the mayor of that town (Mr. John Clark). The event was celebrated with considerable ceremony, a large party of leading residents being invited to accompany the corporation to the reservoir. The company started from the Mansion House about noon, and at the site of the new works were met by the mayor and the corporation of Rotherham, who had been invited to take part in the proceedings, the respective watersheds of the two corporations adjoining. A procession was formed from the superintendent's house, headed by a body of police and the mace-bearers, and in this way the site of the ceremony was reached. A very handsome trowel and mallet were presented to his worship, with which he proceeded to lay the stone, a handsome block of Greenmoor, worked by Messrs. Anelay, contractors for the buildings. The vicar of Doncaster (the Rev. F. Pigou, M.A.) offered up a special prayer, and the ceremony was complete. The mayor of Doncaster then addressed the assemblage, congratulating his fellow-townsmen upon the fact that day accomplished, and more especially upon the fair prospect it held out of Doncaster being furnished before long with a good supply of pure water. Three cheers were then given for his worship, and also for the mayor of Rotherham, who in suitable terms acknowledged the compliment. Cheers followed for the vicar of Doncaster, and for the engineer of the works, Mr. B. S. Brundell, C.E., after which the procession returned. The mayor and corporation of Doncaster then entertained the whole party to a champagne luncheon in a marquee built for the occasion, and about three o'clock the carriages returned to Doncaster. The same evening a large party of gentlemen, including the mayor and corporation of Rotherham, were entertained to dinner at the Doncaster Mansion House, the mayor presiding. Covers were laid for about 70, and a very handsome dinner was served. The *Doncaster Gazette* gives the following particulars of the new works:—"The main reservoir is to be in Silverwood Valley, on the stream dividing the estates of Mr. Bosville and Mrs. Fullerton. The two smaller reservoirs will be as tributaries of Hooton Brook, above Ravenfield Fish Ponds. The following brooks and streams will be brought into the reservoirs:—Hooton Park Brook, three tributaries of Hooton Brook and Silverwood Brook. The whole of the reservoir will cover an area of about 56 acres. The large reservoir will contain 270 million gallons of water, and the two smaller ones over 22 million gallons, so that there will be a total storeage of 292 million gallons of water. The average rainfall of the district is 27 inches, and taking the lowest estimate, that in extraordinary dry seasons it would not be possible to collect more than 6½ inches, they would be able to have a supply of 476 million gallons. It is estimated that when these reservoirs are filled the town will be in a condition to be supplied with water for 250 days, supposing that during the whole of that period there was no rain, a contingency which is quite beyond probability. It is expected that when finished the work will only cost the ratepayers at a rate of £2 13s. per head. The three reservoirs will all be connected by a 4-feet conduit. The reservoirs are distant 8½ miles from Doncaster, and the water will be conducted to the town in large cast-iron pipes. The total cost, according to the tender, will be £42,538 15s. 10d., independent of a separate tender for the erection of an engineer's office and other buildings, upon which over £800 has been spent. Mr. B. S. Brundell, of Doncaster, member of the Institute of Civil Engineers, is the engineer. The contractor is Mr. James Thane, of Maryport; Mr. Morton is the contractor's agent, and the builders for the engineer's residence are Messrs. T. and C. Anelay, of Doncaster. The reservoirs are to be finished by January, 1877."

Register of New Patents.

1423.—Fearnley, W. G., Camberwell, Surrey, "*Improvement in apparatus for heating ovens.*" Application dated April 23, 1874.

According to these improvements it is proposed to use gaseous fuel, such as carburetted hydrogen gas, combined with a suitable proportion of atmospheric air, in lieu of solid fuel for heating bakers ovens. For this purpose the oven is fitted with an arrangement of pipes which will so distribute jets of flame as effectually to heat the oven without producing smoke, and will present little or no obstruction to the filling of the oven with the batch intended to be baked.

1424.—Wilson, M., Brixton, Surrey "*An improved method of and apparatus for supplying oxygen in rooms and other closed places wherein the air is vitiated by the burning of gas or other lights.*" Provisional protection only obtained. Dated April 24, 1874.

This invention relates to a method of and apparatus for preventing the vitiation of the atmosphere in rooms or apartments, or other close places lighted by gas-burners, by producing oxygen artificially to supply the deficiency caused by the combustion at the burners.

The invention consists in placing in a small receptacle over the burner a substance which when heated will give off oxygen. It is preferred to use a mixture of oxide of manganese and chlorate of potassa in the form of powder, but the oxide of manganese or the chlorate of potassa may be used alone, or any material which in a powdered or solid form will emit oxygen when subjected to heat.

The apparatus constructed especially for application to a gas-burner is formed by the combination of a chamber or receptacle for the powdered substance, with a cover for arresting the smoke. These covers commonly consist of a central top piece of metal or other material, which is placed above the globe of the gas-burner, and is surrounded by a rim or coronet which supports the top piece, and gives an ornamental appearance to the cover. In the central portion of this top piece a chamber or receptacle is formed to contain a sufficient quantity of the powdered substance from which the oxygen is to be produced. This chamber in existing covers may be formed by fitting a disc of copper or other metal in the cover, so as to form the chamber or enclosed space between the disc and the upper portion. At or near the top a number of small holes or perforations are made, through which the oxygen may escape freely into the space surrounding the burner. The top of the chamber also has an aperture for filling it with the powdered substance, closed with a screw plug or other stopper which may be readily removed and replaced, and which may be the ordinary pinnacle of such covers, or a plug or stopper made especially for the purpose.

Instead of having the receptacle attached to the globe or burner, a cup or vessel containing such powdered substance may be suspended from the ceiling or other support above the burner.

1426.—Towle, J., Oxford, "*Improvements in the means employed for collecting, treating, and distributing sewage.*" Provisional protection only obtained. Dated April 24, 1874.

These improvements consist in collecting the liquid sewage, and filtering it through beds of solid town refuse contained in pits or receivers having perforated floors, placed over or in connexion with a well, from which the liquor is pumped into a tank placed at a sufficient elevation to enable the sewage to gravitate through a syphon system to any and every part of the country demanding it.

1435.—Lowe, C., and Gill, J., Manchester, "*Improvements in the manufacture and separation of certain mixed coal tar products.*" Patent dated April 24, 1874.

The object of this invention is to effect and faciliate the separation of carbolic acid from the cresyllic and other liquid tar acids. The nature of this invention is—1. To submit the partially or wholly hydrated mixtures of tar acids to the sufficiently prolonged action of temperatures varying between 15° Fahr. and 56° Fahr. 2. To separate the more or less hydrated carbolic acid crystals thus formed from the mother liquors containing the liquid tar acids and a residue of carbolic acid dissolved in them. 3. To effect complete purification of the more or less hydrated carbolic acid crystals thus obtained by recrystallization, either by partial fusion or solution in water with subsequent refrigeration. 4. To prepare carbolic acid of high or complete degrees of purity by dehydrating the partially or wholly purified more or less hydrated carbolic acid crystals.

1490.—Lee, J. W., Cambridge, "*Improvements in the manufacture and working of direct acting pumps.*" Provisional protection only obtained. Dated April 29, 1874.

These improvements consist—1. In putting the working barrel close to the blast-holes at the bottom of the pump. 2. In contracting the top part of the barrel. 3. By placing the valve or bucket at the botton of the pump, and connecting it by means of a long rod. The wear and tear of the buckets and working barrel is thus reduced to one-fourth. It is proposed to make the pumps double or single, or of any kind of material, and to connect the contracted or top part of the pump with the working by means of a socket or flange joint.

1491.—Sellars, J. C., Birkenhead, "*Improvements in and connected with the manufacture of metal-founders blacking.*" Patent dated April 29, 1874.

The main object of this invention is to provide a metal-founders blacking possessing good sleeking and heat-resisting properties.

As means for obtaining this blacking in retorts or vessels from which the air is wholly or nearly altogether excluded, a mixture of tar, peat, and alkali, is combined. A mixture of only peat and alkali can be used, but the product is not so good.

The alkali used should be caustic soda or potassa, or the carbonates thereof alone or together. In place of the caustic alkali or carbonate, sulphate of soda or potassa may be used, although not so advantageously. It is preferred to carbonize the mixture in ordinary gas-retorts, collecting and purifying in any ordinary way the gases evolved by the destructive distillation of the tar and peat, which is facilitated by the presence of the alkaline matter. The gases when purified are used for lighting and heating. If a careful selection of tar and peat is made, and proper proportions used, the resulting hydrocarbon gases are not inferior

in lighting and heating qualities to coal gas. The coke resulting from the carbonization of the mixture is drawn into air-tight vessels, allowed to cool, and is, when ground, the product constituting a new manufacture under this invention.

The tar, peat, and alkali, or the peat and alkali before being carbonized, are treated in any of the following ways:—(*a*) Lump peat or peat smalls is taken and saturated with alkaline solution, dried, and afterwards ground with tar. (*b*) Tar is heated by steam, the alkaline solution is crutched in until thorough admixture is obtained, peat or peat smalls added, and the composition ground together. (*c*) The peat is treated with alkaline solution and dried tar. Peat or tar and solid alkali might be mixed or ground together, but the result is not so satisfactory.

It is found that the following proportions of materials and treatment answer well in practice:—Air-dried peat blocks or smalls, two tons; coal tar as usually delivered from gas-works, one ton; caustic soda or potassa, 37 lbs. dissolved in about 80 gallons of water; the whole being thoroughly incorporated by grinding under edge runners, or otherwise, and then supplied to the distillating retorts in blocks or convenient pieces. Instead of the 37 lbs. of caustic soda or potassa, 50 lbs. of soda ash may be used. When sulphate of soda or potassa is used, about 74 lbs. should be used to the quantity of peat and tar above mentioned. The same quantity of alkaline matters may be employed when the tar is omitted, but in this case the gas given off during distillation will not be of such good quality as regards illuminating power.

In practice it is preferred to use vertical retorts with doors at the bottom, so that the resulting carbonaceous matter can be withdrawn into closed vessels out of contact with air.

Some of the carbonaceous product may be used as metal-founders blacking without grinding, but ordinarily the product is ground between horizontal millstones or like appliances.

1509.—Bond, F. T., Gloucester, "*Improvements in filtering and purifying water and other liquids, and in apparatus therefor.*" Provisional protection only obtained. Dated April 30, 1874.

The first part of this invention consists in the introduction of two improved and alternative forms of filter, one of which floats on the surface of the liquid to be filtered and is connected by mean of a flexible tube with a tap in the containing vessel, whilst the other is connected by an inflexible tube. The floating filter is open at the top, or has a simple cover with a lid; the fixed one has a cover into which is fitted an open tube rising to the top of the outer vessel. They are both of them upward filters, the lower portion of each being composed of two perforated plates which appropriate filtering materials interposed; and the rate at which the liquid flows through them is determined by the difference between the level of the liquid inside and outside of the filter, and by the tap. Either filter may be made to work as a syphon.

The second part of the invention consists in exposing water when filtering to the prolonged action of charcoal and other oxidizing agents by packing the filter and effluent tube therewith, and in the use of a new oxidizing material for the purpose, in the shape of pumice stone, or other similar porous substance coated with reduced platinum, the oxidizing effects of which, when in contact with water either at high or ordinary temperatures, are very powerful.

1510.—Bond F. T., Gloucester, "*The preparation of improved materials for disinfecting and deodorizing purposes.*" Patent dated April 30, 1874.

The object of this invention is to combine certain metallic and other matters, especially the sulphates or chlorides of aluminum, iron or copper, with sawdust, so that the latter shall be saturated therewith. For certain purposes the oxides of these metals are precipitated in and upon the sawdust, by treating it, when saturated with the salts, with ammonia, or carbolic acid is combined therewith.

1530.—Brine, G. J., and Allen, T., Southsea, Hants, "*Improved cisterns or cistern apparatus for discharging or flushing at intervals and preventing waste of water.*" Provisional protection only obtained. Dated May 1, 1874.

These improvements consist in forming the cisterns with a moving bucket or chamber within them which may be tilted mechanically when desired, and its contents delivered to a discharge or flushing pipe. The bucket or chamber is provided with one or more openings or orifices for filling from the water, by which it is surrounded or partly surrounded, when it falls back or is brought to its normal position within the cistern.

1531.—Gercke, K. L. H., Berlin, "*Improvements in apparatus for regulating and measuring the flow of gas or other fluids.*" Provisional protection only obtained. Dated May 1, 1874.

The apparatus for regulating the flow of gas consists of a balance-arm having a valve at one end and a counterweight at the other, and provided with an inclined guide-way, on which a ball is free to move to regulate the working of the arm and valve. According to changes of pressure in the column of gas between this apparatus and the burners, the ball moves nearer to or farther from the counterweight, thereby increasing or diminishing the weight, and regulating the opening of the valve in proportion to the increase or decrease in the consumption of the gas.

The apparatus for measuring gas consists of a casing in which a drum carrying external vanes is capable of revolving, the vanes just touching the inside of the casing. The spaces between the vanes form compartments into which the gas is successively admitted, and which in turn come opposite an outlet leading to the regulator. Here there is a sort of spring stop, which, as the compartment becomes empty, gradually yields to the pressure exerted by the gas in the following compartments, and finally allows the abutting vane to pass, so that another compartment comes opposite the outlet. The gas passed through the apparatus is registered by connecting a counter to the axle of the drum.

1550.—Knowles, Sir F. C., Lovells Hill, Berks, "*Improved manufacture of gas for heating purposes.*" Patent dated May 2, 1874.

This invention relates to the generation of pure or nearly pure carbonic oxide gas, which is effected by the following processes:—

In the first, pure carbon is obtained by calcining limestone or chalk, and then converting into carbonic oxide the carbonic acid gas evolved. This gas can be used alone or in mixture for general heating purposes.

In the second method, the black oxide of manganese (called wad) and the fuel—namely, charcoal of wood or of peat, coke, or anthracite coal—are reduced to powder, and having well mixed them in such a proportion as to have the carbon to the free oxygen as nearly as may be in the ratio of six to eight, the mixture is exposed in close retorts to a strong red heat. Carbonic oxide gas is evolved, which is to be led into suitable gasometers. When the retorts are discharged, the residual mixture is at once to be thrown into water while hot, in order that the manganese may again take up the oxygen which it has lost. It may thus be used over and over again, with little waste and cost of material.

The third method yields a gas composed of about 75 per cent. of carbonic oxide, and 25 per cent. of nitrogen. The fuel (charcoal, coke, or anthracite coal) having been reduced to powder as before, is well mixed with pulverized nitrate of soda, previously dried, with which it forms a kind of meal gunpowder, though not itself explosive. Upon raising this mixture to a low red heat in retorts, it deflagrates, and evolves a mixture of nitrogen, carbonic acid gas, and carbonic oxide. The carbonic acid gas unites with the soda of the nitre to form a carbonate. The cabonic oxide and the nitrogen, in the proportion of about 75 to 25, are set free, and may be collected as usual. It is well to let the fuel be a little in excess of the exact chemical proportion, in order to ensure the absence of carbonic acid gas; as an intense heat is evolved, this is easily done. The residue, carbonate of soda, is very valuable, and more than pays the whole cost of the process. It is free from sulphates and sulphurets, and after lixiviation to free it from any coally matter, and evaporation to dryness, yields a very pure carbonate of soda.

The proportion of pure carbon to the dried nitre is chemically about one-fourth of its weight; so that, according to the nature and composition of the fuel, the proportion of the fuel to the nitre is readily determined. This suffices to saturate the soda with carbonic acid, and to furnish the 75 per cent. of carbonic oxide in the gas evolved.

The above gases when burned give out a very intense heat, and they may be easily applied for that purpose, either in domestic use, or in any kind of manufacturing operation, or of metallurgy.

As it may be objected to the use of these gases for domestic purposes, that they have no odour and cannot be detected by smell when they accidentally escape, the inventor prefers, by way of precaution against danger, to use them mixed with gas obtained from peat, which gives a gas of high heating power. About 10 to 20 per cent. of peat gas will have the effect of giving to the compound an empyreumatic odour, not unpleasant, such as to render its escape very perceptible. In such a mixture, the above gases may be as safely distributed for heating purposes as other gas is at present for lighting.

A gas containing about 60 per cent. by weight of carbonic oxide and 40 per cent. of nitrogen gas may be prepared by putting in a closed cupola alternate layers of limestone or chalk and coke, anthracite coal, or charcoal, and keeping up the combustion of such fuel by means of a fan blast, so regulated that no carbonic acid should be evolved from the upper part of the cupola, the calcined lime being from time to time discharged below by a revolving cylinder with an aperture in the side. The proportions of anthracite would be about one-third the weight of the limestone or chalk, and if coke, in proportion according to its richness in carbon.

1584.—Sugg, W. T., Vincent Street, Westminster, "*Improvements in apparatus for regulating the supply of gas.*" Patent dated May 5, 1874.

This invention has reference to modifications or improvements upon apparatus for regulating the supply of gas for which letters patent, No. 2277, dated Sept. 5, 1866, No. 3133, dated Oct. 13, 1868, and No. 2841, dated Sept. 26, 1872, were granted to the present inventor, and relates more especially to the latter. It consists in either attaching to the hollow valve-spindle of the governor, and above the diaphragm, a burner nib of glass, steatite, or other suitable non-corrodible substance with a slit, orifice, or orifices having a proportionate correspondence according to the quality of the gas to be consumed by the burner. The same object may be attained by piercing the diaphragm and shield with suitably sized orifices, or the nut which fastens the diaphragm and shield to the hollow valve-spindle may be so made as to admit of the insertion of a screw, the conical or other suitably shaped point of which enters the hollow spindle. By turning the screw, the size of the outlet or gas way, from the hollow spindle to the chamber above the diaphragm and beneath the burner where the gas is consumed, may be regulated with the greatest nicety, and made at pleasure to correspond with or vary from the size of the orifice in the burner where combustion takes place. In both cases the spindle is hollow in the direction of its axis, and has one or more radial holes which serve as channels to convey the gas from beneath the diaphragm to the chamber above it.

Another modification or improvement consists in the application of a spring or springs in lieu of, or in addition to, a weight for adjusting the governor to the pressure at which it commences to regulate.

FIG. 1

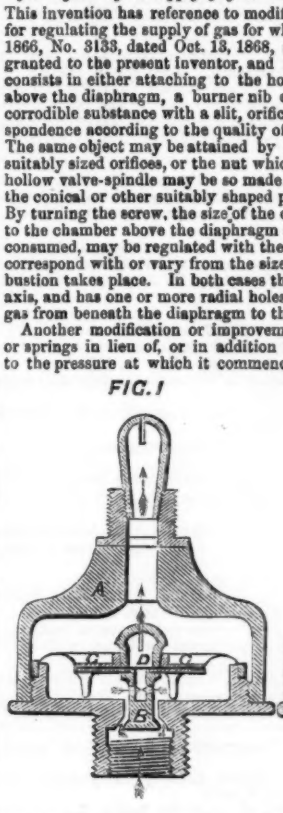


FIG. 2

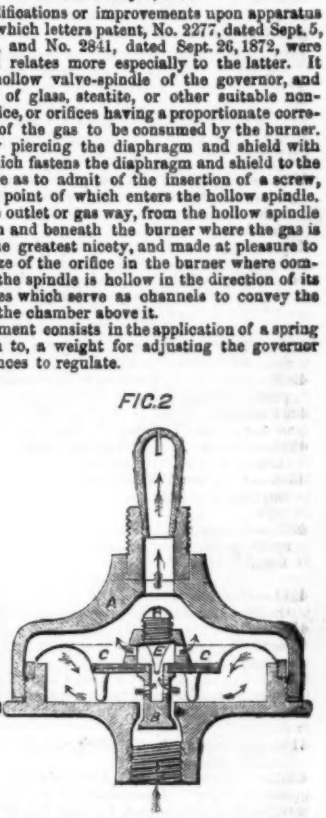


Fig 1. is a sectional elevation of the regulator—A being the case; B, the valve; C, the diaphragm; and D, the burner nib attached to the valve-spindle. Fig. 2 is also a sectional elevation of a regulator, differing only from the other in size and the arrangement for regulating the size of the hole or conduit from the lower chamber to the upper chamber. In this figure A is the case; B, the valve; C, the diaphragm; and E, the screw, the point of which is made to enter the conduit, and increase or decrease the size of the passage in accordance with the direction in which the screw is turned.

1589.—Lenoir, F., Paris, "*Improved apparatus for carburetting gas.*" Patent dated May 5, 1874.

The carburetting apparatus which forms the subject of this invention does not require the employment of any spongy or porous body, nor any cotton-wicks or pumice-stone to facilitate the carburetting process, the carburetting liquid being in direct contact with the gas to be carburetted. The gas enters at one end of the apparatus, in which it is made to pass in a zigzag or serpentine direction, by arranging a series of vertical partitions above the bulk of the hydrocarbon liquid, and it passes out of the apparatus saturated with the volatile parts of this liquid.

One of the distinguishing features of the apparatus is the manner in which the supply of the hydrocarbon liquid is maintained in the carburetting chamber, and the heavy oil is removed therefrom. This is effected by means of a dropping tube or Mariott's pipe, provided with a stop-cock, and connected with a reservoir above. The removal of the heavy oil which is deposited at the bottom of the carburetting chamber is effected by means of a small intermediate chamber, provided with a two-way cock, and situated between the carburetting chamber and a tank provided to receive the heavy products.

1602.—Fisher, D., Pimlico, "*Improvements in meters for measuring water and other fluids.*" Provisional protection only obtained. Dated May 6, 1874.

The features of novelty of this invention consist in constructing a rotary meter, by means of which water and other fluids shall be more accurately registered than at present. This is obtained by placing inside a circular box or cylinder two pinions gearing with each other, and of such a diameter that the teeth opposed to those in gear shall touch the inside periphery of the box. There is ensured, as nearly as possible, a perfect seal, by placing a strip of soft metal at the points of contact of the pinions and the box. The spindle of one of the pinions passes through the top of the box, and gives motion to a registering apparatus.

1629.—KAULBACH, E., Gower Street, Bedford Square, London, "*An improvement in the means of and apparatus for raising and lowering gaseliers and chandeliers, the same being applicable also for other purposes.*" Provisional protection only obtained. Dated May 8, 1874.

Instead of employing counterpoises, as it has heretofore been the practice to do, in order to keep the gaselier or chandelier in its place and at a required height, pressure, or friction is applied upon the inner tube, thereby diminishing the weight upon the ceiling by one-half. The application of the pressure moreover is so contrived that it ceases the moment an effort is made to push the gaselier up, and is exerted only when the force of gravity is allowed to act upon it. There are several ways of accomplishing this. One of these consists in the employment of a circular chamber situated at the top of the outer tube of the gaselier or chandelier. Inside this chamber are three little carriages that radiate directly towards the inner tube at an angle apart of 120°. On the under surface of these carriages, and arranged longitudinally, is a row of processes or teeth that fit into a spiral groove cut in the surface of a moveable circular disc, so that according as this disc is made to turn to the right or to the left the aforesaid carriages approach or recede from the central tube simultaneously and with an equal motion. These carriages are further provided with a bascule, the extreme action of which is limited to about 3-16ths of an inch. This bascule carries a small friction roller at the end next the central tube, which roller is made to impinge upon the said tube with a pressure that may be regulated according to the weight that has to be supported by means of the spiral aforesaid. Above the carriages is a metal ring, whose diameter is equal to the inner diameter of the chamber. This ring is not a fixture, but merely rests upon the rear of the carriages, and when so resting prevents the action of the bascule. This ring is connected with the outer tube of the gaselier which it supports. It thus happens that when the gaselier is pushed upwards, the bascule being relieved of its weight is immediately brought into play, and the pressure taken off the inner tube, but it is again in full force the moment the weight of the gaselier rests upon the bascule.

1652.—BUTTERWORTH, E., Manchester, "*Improvements in air and gas engines.*" Provisional protection only obtained. Dated May 9, 1874.

This invention is applicable to the air and gas engines described in patent No. 434, Feb. 12, 1866, and consists in keeping the cylinder and exhaust valve cool by forcing the water from a large cistern through the jacket or chamber surrounding the cylinder and through a jacket applied to the exhaust valve with its pipes.

1689.—ALSING, G., of Preston, "*Improvements in the manufacture of an artificial fuel from sewage deposits, nightsoil, and other dry and moist manurial matters mixed with other materials.*" Provisional protection only obtained. Dated May 12, 1874.

The novelty of this invention consists in utilizing sewage deposits, nightsoil, and other dry and moist manurial matters, by mixing it with carbonaceous, deodorizing, bituminous, and other suitable material for the purpose of making it into a useful and cheap artificial fuel.

APPLICATIONS FOR LETTERS PATENT.

4290.—VERRIER, C., Rue Lafayette, Paris, "An improved water-meter and feeder apparatus for boilers." A communication. Dec. 12, 1874.

4297.—BENNIE, R., London, "Improvements in condensing apparatus for steam pumping-engines." Dec. 14, 1874.

4305.—SCOTT, H. Y. D., Ealing, Middlesex, "Improvements in the treatment of sewage and nightsoil." Dec. 14, 1874.

4308.—CLARK, A. M., Chancery Lane, London, "Improvements in the manufacture or production of ammonia." A communication. Dec. 14, 1874.

4326.—ALLAIRE, P. L., Paris, "An improved manufacturing lighting gas by employing petroleum, schiste, or other mineral or volatile oils." Dec. 16, 1874.

4357.—GREEY, E. J., Halstead, Essex, "Improvements in mechanism applicable to the construction of gas, steam, or water engines and pumps." Dec. 17, 1874.

GRANTS OF PROVISIONAL PROTECTION.

4111.—CROSSLEY, L. J., and HANSON, R., Halifax, and HICKS, J. J., Hatton Garden, London, "Improvements in water-gauges." Dec. 1, 1874.

4168.—GOODALL, R., Armley, near Leeds, "Improved means or method of clarifying impure water or sewage, and preparing the precipitate or sludge for re-use." Dec. 3, 1874.

4162.—CLARK, A. M., Chancery Lane, London, "Improvements in the musical instrument known as the pyrophone." A communication. Dec. 3, 1874.

4189.—WILLANS, P. W., Blackheath, "Improvements in hydraulic engines and pumps." Dec. 5, 1874.

4195.—SELLARS, J. C., Birkenhead, "Improvements in artificial stone." Dec. 7, 1874.

4200.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in carburetters." A communication. Dec. 7, 1874.

4212.—WOLSTENHOLME, J., and THORPE, C., Radcliffe Bridge, Lancs, "Improvements in steam-pumps and pumping-engines." Dec. 8, 1874.

4213.—ASHWORTH, G., and ASHWORTH, E., Manchester, "Improvements in steam-pumps and pumping-engines." Dec. 8, 1874.

4227.—SUGG, W. T., Westminster, "Improvements in gas-burners, parts of which are applicable to other gas-fittings, and in the method of constructing and manufacturing the same." Dec. 9, 1874.

4251.—CAVE, J. O'C., Weston-super-Mare, "Improved apparatus for obtaining light and heat." Dec. 10, 1874.

NOTICES TO PROCEED.

2708.—HADDAN, J. C., Strand, London, "Improvements in the direct reduction or treatment of sulphides, oxides, and metallic carbonates in reverberatory furnaces, with gas produced from the decomposition of water." A communication. Aug. 5, 1874.

3784.—VALLÉ, B. H., Stow-on-the-Wold, Gloucester, "Improvements in the treatment and utilization of sewage and in means employed therein." Nov. 3, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

2103.—RAFFERTY, T., Manchester, "Improvements in apparatus used in connecting service-pipes, cocks, and plugs to main gas-pipes." June 17, 1874.

2185.—GAMBONI, P., Harley tSreet, London, "Improvements in pumps or apparatus for raising or forcing air or water." June 23, 1874.

2270.—CLARK, A. M., Chancery Lane, London, "Improvements in the manufacture of gas and fuel." A communication. June 30, 1874.

2330.—COLLS, F. W., Erith, "Improvements in traps for preventing the escape of gases from sewers and drain-pipes." July 3, 1874.

2380.—BEAN, E. E., Boston, U.S.A., "A pneumatic electric gas-lighting apparatus." July 7, 1874.

2466.—JONES, H. L., Holborn, London, "Improvements in apparatus for disinfecting water-closets, urinals, and similar purposes." July 15, 1874.

2986.—HEAPS, E. K., Burton Salmon, and WHEATLEY, W., Brotherton, Yorks, "An improved heating and cooking apparatus." Sept. 1, 1874.

3672.—GREENACRE, T., Turner's Road, London, "Improvements in means or apparatus for manufacturing screws of vulcanite or other analogous material for liquid-meters." Oct. 24, 1874.

3779.—JOHNSON, J. H., Lincoln's Inn Fields, London, "Improvements in slide-valves, which improvements are also applicable to other rubbing surfaces." A communication. Nov. 2, 1874.

Share List,
or
Metropolitan Gas and Water Companies.

(*Corrected by Mr. F. N. GOLDING, Sun Court, Cornhill, from the latest Stock Exchange Quotations.*)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£	GAS COMPANIES.	£ s. d.	£ s. d.	£
8000	20	Anglo-Romano	20 0 0	10 0 0	14 — 16
5000	20	Bahia (Limited)	20 0 0	3 0 0	10 — 11
1000	20	Do., preference	20 0 0	10 0 0	25 — 27
1000	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
1500	20	Do., perpetual preference	20 0 0	7 10 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	6 15 0	6¼— 6⅝
10000	5	Do., fourth issue	4 0 0	6 15 0	1— 1¼
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbridge., and Holywell.)	20 0 0	10 0 0	34 — 35
7500	20	Cagliari (Limited)	20 0 0	7 0 0	14 — 16
180000	10	*Chartered* A ordinary	10 0 0	10 0 0	17¼— 17⅝
25000	10	Do. A, 5 per cent. preference	10 0 0	5 0 0	16— 17¼
20000	10	Do. A, 5 per cent. do., 2nd issue	10 0 0	5 0 0	16¾—17¼ xd
30000	10	Do. A, 5 per cent. do., 3rd issue	10 0 0	5 0 0	15⅛— 15⅝
10000	10	Do. B, 4 per cent. maximum	10 0 0	4 0 0	7⅞— 8¼
20000	10	Do. C, 10 per cent. preference	10 0 0	10 0 0	21 — 23
12000	25	Do. D, 10 per cent. preference	25 0 0	10 0 0	52 — 54
4488757.	Sk.	*Commercial*	100 0 0	10 0 0	179 —182
20000	20	Continental Union	20 0 0	8 0 0	20 — 21
20000	20	Do., new	12 10 0	8 0 0	par—¼ pm.
10000	20	Do., preference (Grmny.: Strsbg. France: Cette, Nismes, Montargis Vienne, Roanne, Beaucaire, Rueil, Albi. Italy: Milan, Genoa, Parma, Modena, Alessandria, Messina.)	20 0 0	7 0 0	25 — 27
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16½— 17¼
5000	10	Do., preference	10 0 0	6 0 0	11 — 13
10000	10	Do., ordinary	10 0 0	7 0 0	12½— 14
2500	10	Do., converted	2 0 0	10 0 0	1½— 2 pm.
2500	10	Do., converted	2 0 0	7 0 0	1 —1½ pm.
23406	10	European (Limited)	10 0 0	10 0 0	14 — 15
12000	10	Do., new shares	7 10 0	10 0 0	2⅝— 3¼
	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	10 0 0	1¾—2¼ pm.
4034	10	Foreign and Colonial (Limited)	10 0 0	..	9 — 10
5800	10	Hong Kong (Limited)	10 0 0	10 0 0	14 — 15
1560000	100	*Imperial*	100 0 0	10 0 0	180 —183
28000	12½	Do., new shares	12 10 0	7 0 0	16¾— 17¼
1300	100	Do., bonds	£100	10 0 0	197 —200
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam., Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Frankfort-on-Maine, Haarlem, Stolberg, and Vienna.)	43 15 0	9 2 6	37 — 39
3000	40	*Independent*	40 0 0	10 0 0	68 — 71
8000	10	Do.	10 0 0	5 0 0	9 — 9½
8000	20	Do.	20 0 0	7 10 0	27 — 29
4500	10	Do., D	3 0 0	10 0 0	3½— 4
378350.	Sk.	*London*	100 0 0	10 0 0	179 —182
1500000.	Sk.	Do., 1st preference	100 0 0	6 0 0	120 —125
14450	Sk.	Do., 2nd preference	100 0 0	6 0 0	
4350	Sk.	Do., 3rd preference	100 0 0	6 0 0	
7622	25	Do., A shares	12 10 0	6 0 0	
268054.	All	Do., Debenture stock	100 0 0	5l. & 6l.	
15000	5	Malta and Mediterranean (Limited)	5 0 0	3 0 0	2 — 2½
6000	5	Do., preference	5 0 0	7 0 0	5 — 5½
20000	5	Mauritius (Limited)	2 0 0	7 0 0	2 — 2½
25000	20	Monte Video (Limited)	20 0 0	..	22½—23½
8000	10	Nictheroy, Brazil (Limited)	10 0 0	..	
30000	5	Oriental (Calcutta)	5 0 0	9 0 0	7½— 7⅝
30000	5	Do., new shares	2 10 0	9 0 0	1—1¼ pm.
10000	5	Ottoman (Limited)	5 0 0	nil.	2 — 2½
17500	10	Pará (Limited)	10 0 0	7 0 0	6 — 8
27000	20	*Phœnix*	20 0 0	10 0 0	36½— 37½
3800000.	100	Do., new	55 0 0	7 10 0	73 — 75
1440000.	Sk.	Do., capitalized	100 0 0	5 0 0	92 — 94
5000	20	*Ratcliff*	20 0 0	10 0 0	33 — 35
36000	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	31 — 33
7359	5	Singapore (Limited)	5 0 0	7 10 0	4½— 5
2000	5	Do., preference	5 0 0	7 10 0	5½— 6
1500	32½	Shanghai	32 10 0	12 0 0	30 — 32
4000	50	*South Metropolitan*	50 0 0	10 0 0	90 — 92
4000	12½	Do.	12 10 0	10 0 0	21 — 23
20000	12½	Do., new shares	5 0 0	10 0 0	6½— 6⅞ pm.
15000	10	*Surrey Consumers*	10 0 0	10 0 0	17 — 18
10000	10	Do., new	8 0 0	10 0 0	6—7 pm.
9000	4	United General (Limerick)	4 0 0	2 10 0	2 — 2½
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	14 — 15
1500	10	Do.	10 0 0	7 10 0	11 — 12
2957	10	Do.	10 0 0	7 0 0	
993	10	Do.	3 0 0	7 0 0	
16000	5	*West Ham*	5 0 0	10 0 0	7½— 8
10000	5	Do., new shares	2 10 0	10 0 0	3 — 4
		WATER COMPANIES.			
12000	100	Chelsea	100 0 0	6 0 0	131 —135
1800000	100	East London	100 0 0	6 0 0	131 —133
8000	50	Grand Junction	50 0 0	7 0 0	79 — 81
3840	25	Do., ¼ shares	25 0 0	7 0 0	39 — 40
2160	25	Do., new do.; maximum dividend, 7½ per cent.	25 0 0	7 0 0	31 — 33
6396	100	Kent	100 0 0	6 10 0	140 —145
5839	100	Lambeth	100 0 0	6 5 0	132 —135
1161	100	Do.	20 0 0	6 5 0	
442	100	New River	100 0 0	8 0 0	176 —180
4475	100	Do.	30 0 0	8 0 0	50 — 56
400000	100	Do., debenture stock, 4 per cent.	100 0 0	4 0 0	97 — 99
3036	100	Southwark and Vauxhall	100 0 0	5 5 0	110 —112
1296	100	Do., preference stock	100 0 0	5 0 0	103 —105
	100	Do., D shares	100 0 0	5 5 0	106 —110
		Do.	..	4 10 0	
	100	Do., new ordinary	..	4 10 0	
1600	100	Do., new ordinary, No. 1	40 0 0	4 10 0	
12172	61	West Middlesex	61 0 0	£6 per sh.	127 —130

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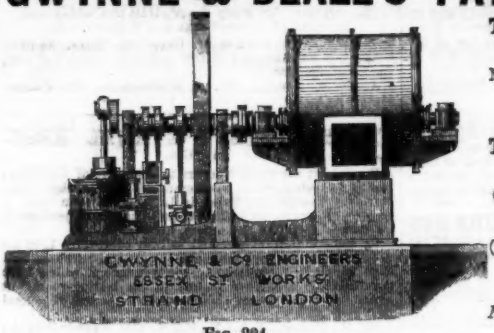

FIG. 224.

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(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

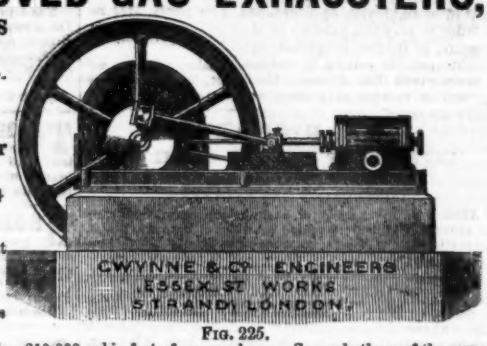

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 62,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

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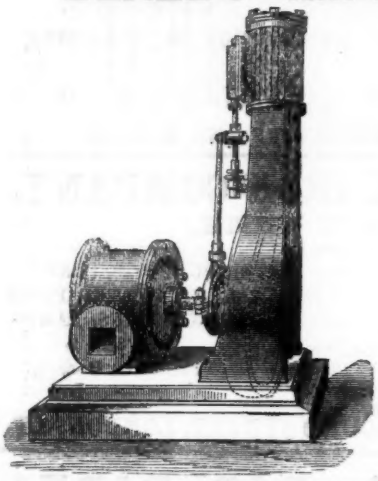
G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

BEALE'S IMPROVED PATENT GAS-EXHAUSTER

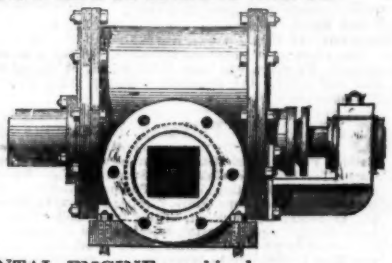


WITH

ENGINE COMBINED

ON

ONE BASE PLATE.



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EXHAUSTERS with OUTSIDE BEARINGS.
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TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
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PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

WANTED, by a young Man, a situation as METER-FIXER, Fitter, Index-Taker, &c.
Address No. 111, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED (second-hand), a small Gas-HOLDER and TANK complete, to contain about 50 cubic feet. Photometer, with necessary appliances, for testing illuminating power of gas.
Particulars, by letter, to R. CUMMING, 17, Leadenhall Street, LONDON, E.C.

WANTED, by the Advertiser, small GAS-WORKS on LEASE, for 7, 14, or 21 years. A per centage upon capital to be paid as rent, increasing every five years. References and guarantee given.
Address No. 115, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, the MANAGEMENT of a medium-sized Gas-Work. Has had 13 years practical experience in the manufacture and distribution of Gas. Can work iron or clay retorts. Is a good fitter, and can produce satisfactory testimonials.
Address No. 102, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, an en-gagement as ASSISTANT MANAGER or Superintendent of a Gas-Work. Has had charge of both building and managing works. Fair draughtsman, with a knowledge of accounts, chemistry, photometer, &c. Can produce testimonials or give references.
Address No. 106, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Working Manager for a Gas Company making 3 to 4 million feet a year. Would have to do all the work. Must be fully up to the manufacture and distribution of gas, service and main laying, and other needful duties. Will have the assistance of a night man during the winter months, and have a cottage on the works, with fire and gas.
Applications, with references and wages required, to be addressed to F. B. STRATHERN, Managing Director, Gas Company, Halesworth, SUFFOLK.

ADVANTAGES OF GAS FOR COOKING AND HEATING,
BY
MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their gas consumers.
Specimen Copy by post 4d., direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

STATION-METER AND PURIFIERS FOR SALE.

ONE Station-Meter with 5-in. connexions and valves; also two PURIFIERS, 4 ft. square. The above are very suitable for a small work, and only removed to make room for a larger set.
For further particulars, apply to the MANAGER, Corporation Gas-Works, ABERAVON.

TO PIPE-LAYERS AND OTHERS.

THE Aberdare Local Board of Health are desirous of receiving TENDERS for laying about 19,000 lineal yards (more or less) of MAIN-PIPES, from 9 in. to 3 in. in diameter, for Water-Works purposes.
Forms of specification and tender may be obtained on application to the undersigned, at the office of the Local Board, Town-Hall, Aberdare, South Wales; or to the Engineer, J. R. Bateman, Esq., C.E., 16, Great George Street, Westminster.
Tenders to be sent to me on or before the 13th of January, 1875, endorsed "Tender for Pipe-Laying."
The Board do not bind themselves to accept the lowest or any tender. By order,
R. ORTON GERY, Clerk to the Local Board.
Dec. 10, 1874.

TO CHEMICAL MANUFACTURERS AND OTHERS.

THE Directors of the Birmingham and Staffordshire Gaslight Company are prepared to receive TENDERS for the whole of the SPENT OXIDE produced at their Saltley, Adderley Street, and West Bromwich works, during twelve months ending April 30, 1876.
Particulars may be obtained on application at the Engineer's Office, Saltley, and tenders, addressed to the Secretary, Offices, Old Square, Birmingham, to be delivered on or before Tuesday, the 4th of January next.
The Directors do not bind themselves to accept the highest or any tender.—By order of the Board,
SAMUEL WALSH, Secretary.

THE International Ice Manufacturing Company hereby give notice that the working of the Small Machine recently exhibited daily at 2, Queen's Buildings, Queen Victoria Street, E.C., has been discontinued, the Company having REMOVED to large premises, 61 and 62, HIGH STREET, BLOOMSBURY.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

E. GODDARD,
GAS-WORKS, IPSWICH,
SOLE AGENT FOR
EDGE'S PATENT
FOR REMOVING THE
CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

HARRIS AND PEARSON,
STOURBRIDGE,
Proprietors of
BEST GLASS-HOUSE POT AND CRUCIBLE CLAY.
Manufacturers of
FIRE-BRICKS, GAS-RETORTS, & FIRE-CLAY GOODS of every description.
Orders of any magnitude, for home and exportation, executed with all possible despatch.
N.B.—A quantity of Retorts in stock. Circulars, 15 in. and 16 in. Ovals, 20 in. by 14 in. D's, 15 in. by 13 in.; 16 in. by 12 in.; 18 in. by 14 in. 20 in. by 16 in.; 21 in. by 14 in.; and 24 in. by 14 in.

Mr. ALFRED LASS,

60, CORNHILL, LONDON, E.C.,

Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.

To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.

To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

WM. RICHARDS,

INVENTOR OF THE DRY GAS-METER,

REVISER OF "HUGHES ON GAS-WORKS,"

CONSULTING GAS ENGINEER,

Advises on all matters of business connected with Gas Lighting. Furnishes Working Drawings of Retort-Settings, Specification of Works, complete or in detail.

17, BURTON ROAD, BRIXTON, LONDON, S.W.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, WESTMINSTER.

PATENT FUEL AND LIME FOR PURIFYING FROM FOUL LIME.

By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

Licences to work the invention will be granted to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

10th Edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,

BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine; (4) Turret Clock, &c.; (5) Electric Telegraph, A B Instruments, Bells, and Apparatus.

J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

Just published, price 10s. 6d.,

REGISTRATION OF DISTRIBUTORY PLANT.

The forms for this purpose are to illustrate the Paper on Distribution of Gas, read at the Edinburgh Meeting of the British Association of Gas Managers. By the use of the synopsis the whole of the out-door plant may at once be seen, with all matters pertaining to the same.

W. J. WARNER, Engineer.

South Shields.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 27 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.

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OXIDE OF IRON.—We are prepared to supply, on moderate terms,

HYDRATED PEROXIDE OF IRON (BOG OCHRE),

Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.

FRANCIS RITCHIE & SONS,

BELFAST.

BIRTLEY IRON WORKS,

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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

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BRAY'S PATENT ENAMEL REGULATORS.

We submit the above Burners to Managers of Gas Companies as being worth a recommendation to their consumers. Though the price is little more than that of common Burners, we believe them to be nearer perfection, for general use, than any others, however costly.

By many important gas and railway companies they are used as being the best obtainable for general purposes, and have supplanted enormously costly burners, which have been made to give good results in the testing-room, but which fail of their effect when brought to the test of general use.

Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner to the City of Glasgow, in a lecture on the "Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow in March last, says: "These are the best Burners obtainable at moderate cost," and, after mentioning several other "good" Burners, which ranged in price up to thirty times the price of ours, he continues, "but these are all costly, and their performance is no better than that of Bray's Burners."

GEORGE BRAY AND CO., BLACKMAN LANE, LEEDS.

ALFRED WILLIAMS,

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GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

THE THAMES BANK IRON COMPANY,

(Successors to LYNCH WHITE,)

SUPPLY FROM STOCK

CAST-IRON RETORTS, SOCKET-PIPES for GAS or WATER PURPOSES, FLANGE-PIPES for STEAM, RAIN-WATER PIPES and GUTTERS, HOT-WATER PIPES and BOILERS, and all requisite Connexions for same; also LAMP-COLUMNS, LAMPS, WROUGHT FRAMES, WROUGHT-IRON TUBING, &c., &c.

All kinds of Gas-Works Apparatus and General Castings made to Pattern or Drawing.

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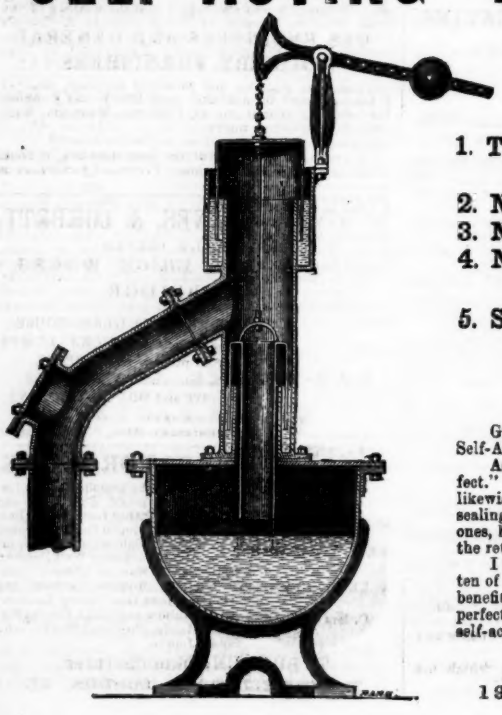
SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to the Patentees,

19, GREAT GEORGE STREET, WESTMINSTER.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

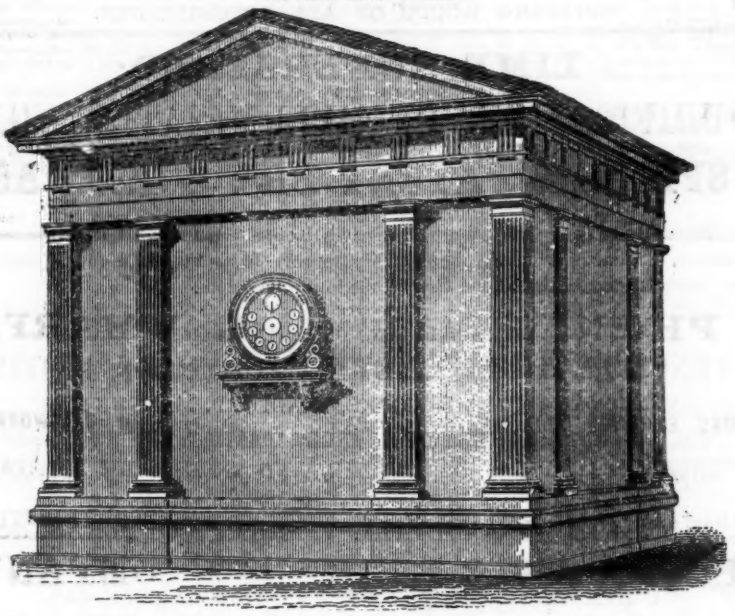
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

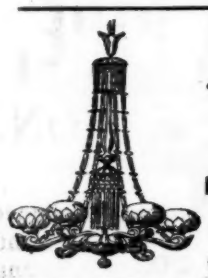
GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.



F. & C. OSLER,

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MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

4, CANNON ROW, PARLIAMENT STREET, S.W.

MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artizan.*

ADDISON POTTER,

WILLINGTON QUAY,

NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of

CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

NEAR

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THOMAS LAMBERT & SONS

MANUFACTURE EVERY DESCRIPTION OF

GAS AND WATER FITTINGS;

ALSO,

WROUGHT-IRON TUBES & FITTINGS.

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EMILY GIBBONS,

Dibdale Fire-Clay Works & Colliery,

Near STOURBRIDGE.

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MANUFACTURER OF EVERY DESCRIPTION OF

Burs, Lumps, Stays, Shields, Blast Furnace and other Bricks & GAS-RETORTS.

Red and Blue Clay Goods, Engineering and other Ironwork, and Fittings supplied.

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WOOD PURIFIER SIEVES,

Which have now been used for twelve years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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CONTRACTORS for the PURCHASE of GAS TAR AND AMMONIACAL LIQUOR,

Also of their products.

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Plans, specifications, and estimates supplied, and contracts taken to furnish and erect Gas-Works complete, for supplying Manufactories, Collieries, Mansions, Halls, Railways, and other works.

Competent workmen sent out to town or country.

Agents for the supply of the best qualities of South Yorkshire House and Gas Coal. Prices and particulars on application.

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BRETTELL'S ESTATE

FIRE CLAY & BRICK WORKS,

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.

Proprietors of

BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.

Successors to

E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

CLOTH GAS-BAGS FOR MAINS.

As supplied to the Imperial, Chartered, and other London and Provincial Gas Companies. Bellows and Valves for inflating Well Dresses, Stokers Gloves, India-Rubber Suction and Delivery Hose, Gas-Tubing, Leather India-Rubber and Gutta-Percha Machine-Bands, Sheet and Washers and Steam Joints.

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THE
HUCKNALL COLLIERY COMPANY
Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

GAS COAL

Of every description delivered f.o.b. United Kingdom, or cost freight and insurance Abroad, upon lowest terms.

Contracts undertaken for the Shipment, Insurance, and Delivery Abroad of Plant and Materials for Gas and Water Works, &c.

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POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 13½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

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THE EARL OF HUME'S
LESMAHAGOW
MAIN SEAM CANNEL COAL.

CRAIGNETHAN GAS COAL CO.,
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Analysis and Price on Application.

WYLAM WOOD COAL COMPANY,
LIMITED,
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WYLAM WOOD CANNEL COAL WORKED FROM ABOVE COLLIERY.
Analysis—10,280 cubic feet of gas per ton of Coal, having an Illuminating Power of 26·2 Sperm Candles, and yields 15¼ cwt of Coke per ton of Coal.
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For prices and further particulars, apply to
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SOLE VENDORS FOR
LONDON & THE SOUTHERN COUNTIES
OF
WIGAN COAL AND CANNEL,
From the Mines of the
INCE HALL COAL & CANNEL COMPANY, Limited,
AND
Messrs. W. H. BRANCKER & Co.

THOMAS READ & CO.,
BRAZILIAN IRON-WORKS,
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MANUFACTURERS OF
GAS and WATER PIPES,
Bends, Tees, and Irregulars,
AND
GENERAL FOUNDERS.
ESTIMATES and PRICES on APPLICATION.

GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
18 & 20, ALSTON STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.
MALLEABLE IRON TUBE FOR GAS, WATER, AND STEAM.
AGENTS FOR THOMAS GLOVER & CO.'S
PATENT DRY GAS-METERS.
DELIVERY F.O.B. ON CLYDE.
Lists on application.

EASTWOOD & CO.,
LIMITED,
Wellington Wharf, Belvedere Road, Lambeth,
AND
Canal Bridge Wharves, Old Kent Road, S.E.
LIME, CEMENT, AND BRICK MANUFACTURERS
AND MERCHANTS.
SHOEBURY AND KENT STOCKS, AND SUFFOLK RED AND WHITE BRICKS DELIVERED IN ANY QUANTITIES, OR BY BARGE ALONGSIDE.

Stourbridge, Newcastle, and Welsh FIRE-BRICKS and LUMPS of all descriptions.	Malam and Moulded Bricks, PORTLAND CEMENT (made from the Medway Earth, &c.) of UNSURPASSED quality.	Grey Stone Lime, FLARE LIME Chalk Lime, Blue Lias, Roman and other Cements.

ALSO
BUILDING GOODS OF ALL DESCRIPTIONS.

LIME SUPERSEDED
IN THE
PURIFICATION OF ILLUMINATING GAS
BY
SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

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SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,
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SOLE MANUFACTURERS OF SPENCE'S PATENT DRY COPPERAS,
SPENCE'S PATENT GAS DEODORIZER, AND MUDIE'S DISINFECTANT;
MANUFACTURERS OF
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PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND
CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

D. BRUCE PEEBLES & CO.'S
PATENT
LAMP REGULATOR

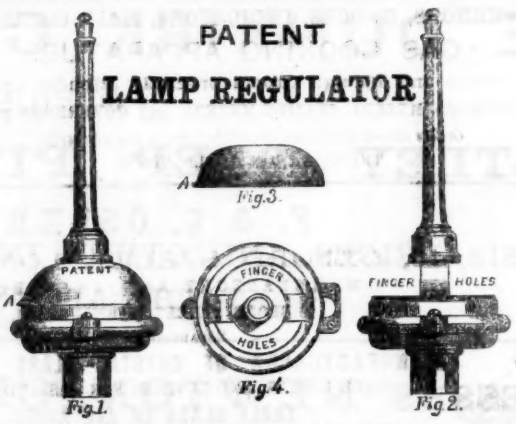

Fig.1. Fig.4. Fig.2. Fig.3.

D. BRUCE PEEBLES AND CO.,
ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,
PATENTEES OF
GAS REGULATORS FOR PUBLIC LAMPS, FACTORIES, PUBLIC HALLS, AND DWELLING-HOUSES.

Attention is respectfully requested to the following extract from a lecture "On the Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow, by Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner for the city of Glasgow, on the 4th of March last:—

"A few years ago, a simple form of Gas Regulator for Street Lamps was introduced, I do not know by whom, and various forms of it, and improvements on it, have been made by many practical gas engineers. Of all the modifications of the instrument, the best in my opinion is that of Mr. D. Bruce Peebles, of Edinburgh; in fact, his Lamp Regulators are so superior that they are likely to supplant all others. Already about 9000 of these have been applied to the street-lamps in Glasgow, and I understand it is the intention of the authorities to introduce them all over the town. The saving thereby effected I calculate to be about £6000 per annum, without any diminution of light. One of the great advantages of Mr. Peebles's apparatus over all others is that it can be regulated while the gas is burning."

Since the above date, another 1000 have been supplied to Glasgow, and they are being largely adopted at home and abroad.

D. B. P. and Co. are prepared to Estimate for the Supply and Maintenance of their Regulators, and will be glad to forward terms on application.

D. BRUCE PEEBLES AND CO.,
ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,
FOUNTAINBRIDGE WORKS, EDINBURGH.

G. J. EVESON,
GAS COAL MERCHANT,
STOURBRIDGE.

Delivery per Rail to any Part.

THE WIGAN COAL AND IRON COMPANY,
LIMITED,

COLLIERY PROPRIETORS,

(HEAD OFFICES: WIGAN, LANCASHIRE;

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Supply the Best Wigan Arley Mine Gas Coal & Nuts,

THE BEST HAND-PICKED ROUND CANNEL,

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Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

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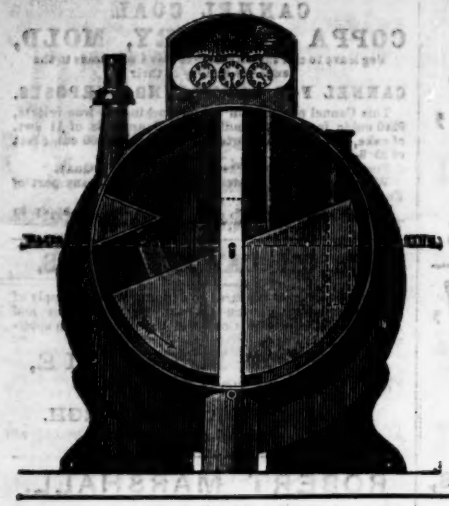

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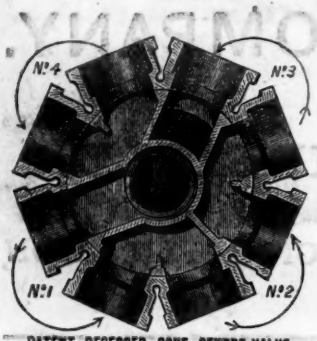

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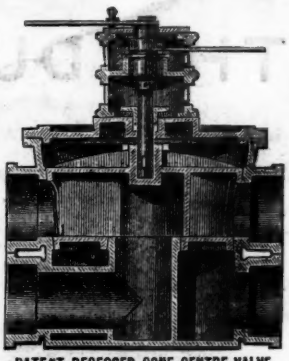
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